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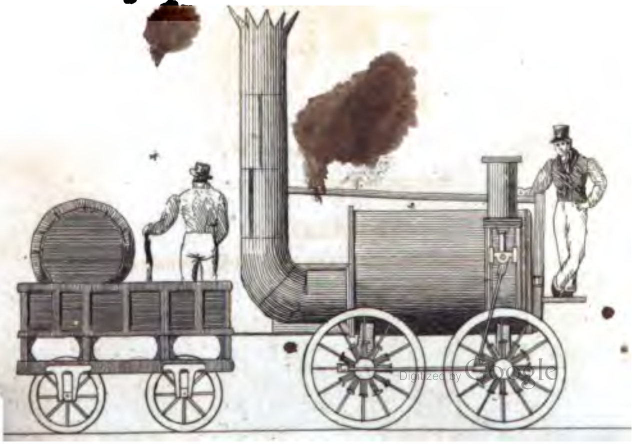
LIVERPOOL PRIZE ENGINES.

THE ROCKET.

THE NOVELTY.



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T. 1830

ARCANA

OF

SCIENCE AND ART:

OR AN

ANNUAL REGISTER

OF

POPULAR INVENTIONS AND IMPROVEMENTS,

ABRIDGED

FROM THE TRANSACTIONS OF PUBLIC SOCIETIES, AND FROM THE SCIENTIFIC JOURNALS, BRITISH AND FOREIGN, OF THE PAST YEAR.

WITH SEVERAL ENGRAVINGS.

Science is in fact nothing more than the refinement of common sense, making use of facts already known to acquire new facts.

Last Days of a Philosopher—By Sir HUMPHRY DAVY.

LONDON:

PRINTED BY JOHN LIMBIRD, 143, STRAND.

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The design of an *Annual Register of Science and Art* having already been adjudged characteristic of an age of invention and improvement, the Editor has little hesitation in presenting this volume to the public. Its contents are, indeed, identified with the interests and comforts of so large a portion of the community, that he hopes he shall not be suspected of vanity in aspiring to an useful, if not a more elevated rank, in annual literature.

The present being the third volume of the *Arcana of Science and Art*, needs but little prefatory introduction; since the popularity of the two preceding volumes has been so extensive, and their success considered so near completeness, that the Editor resolved to "let well alone," and produce this volume upon the plan of its predecessors. The novelty of the following pages consists, therefore, in the subjects themselves, and not in their arrangement. The increasing spirit of public intelligence, and the very general cultivation of all branches of useful knowledge have done much towards the production of the many new facts and phenomena which this work contains or illustrates; and as every class of well-informed society has thus contributed towards its contents, in like manner, there is scarcely an individual to whom one or more of its departments will, not prove essentially useful. Thus, the practical man will perhaps, first turn to the Mechanical Inventions, which present a most gratifying picture of the progress of ingenuity and its anticipated results on national superi-

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ority and individual interest. The lover of experimental philosophy will as anxiously look for the progress of Chemical Science, and there enjoy an intellectual treat of a very high order. The student of Nature may add to his knowledge of her great and glorious works in Botany, Geology, Mineralogy, and Meteorology, by a collection of Facts which have the sanction and testimony of the first philosophers to recommend them to his attention. To the several branches of Domestic and Rural Improvement, or such as are the business of every-day life, the remainder of the volume contributes many valuable suggestions for enlarging the enjoyments of social life, by adapting the principles of science to the plainest practical purposes; whilst a few pages of Notes on "Expeditions of Discovery" open to the more speculative mind illimitable scenes of enterprize and activity.

Every page, therefore, abounds with experience and inference, and as all knowledge has thus accumulated with time, the Editor hopes his Abstract of the Useful Knowledge of the Year 1829, may be allowed a place among the records of public improvement.

Engravings are occasionally introduced, though, in most cases, more for embellishment than for actual explanation; since every article, it is hoped, is so simple and attractive in itself as to need nothing further to commend it to the reader, or to prove that in each department, as beautifully observed, of modern chemistry by the lamented Sir Humphry Davy;—"its beginning is pleasure, its progress knowledge, and its objects truth and utility."

London, Feb. 26, 1830.

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CONTENTS.

ERRATA.

At page 151, for Hydrocyanic Prussic Acid, read Hydrocyanic *or* Prussic Acid.
In Note at page 166, for insects, read *animals*.

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ENGRAVINGS.

PLATES.

WOOD-CUTS.

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THE

ARCANA OF SCIENCE,

&c. &c.

Mechanical and Useful Inventions.

GRAND MECHANICAL COMPETITION—RAIL-ROAD RACE FOR £500.

(See the Frontispiece.)

SOME time previous to the completion of the great rail-road between Liverpool and Manchester the directors of the undertaking announced that they would give a premium of 500*l*. for the locomotive engine which should, at a public trial to be made on the 1st of October (afterwards postponed to the 6th,) draw on the railway a given weight with the greatest speed at the least expense. The offer of so handsome a premium, and the brilliant professional prospects which the winning of it presented to mechanical men, naturally exerted a very lively spirit of competition among them. In almost every quarter of the country, engine makers and engine inventers set themselves to work to secure the prize; and the result, we are happy to say, has been such as to furnish a lasting example of the wisdom of calling into action, and giving fair play to *the general talent of a country*, when any great public object has, as in the present instance, to be accomplished.

The principal conditions on which the prize was offered were these:—1st. That each engine entered for the competition should weigh not more than six tons, and be capable of drawing after it, day by day, on a level plain, a train of carriages of a gross weight, equal to three times the weight of the engine itself, at a rate of not less than ten miles per hour, with a pressure of steam in the boiler not exceeding 50 lbs. on the square inch. 2. That the engine and boiler should be supported on springs, and rest on six wheels, and the height from the ground to the top of the chimney should not exceed 15 feet. 3. That the engine should "effectually consume its own smoke;"—and 4. That there should be two safety-valves, one of which should be completely out of the reach of the engine-man's interference.

The gentlemen appointed by the directors to act as judges on the occasion were—J. U. Rastrick, Esq., of Stourbridge, civil engineer; Nicholas Wood, Esq.; of Killingworth, civil engineer (author of the excellent work on railways); and John Kennedy, Esq. of Manchester.

The portion of the railway chosen for the "running ground" was on the Manchester side of Rainhill Bridge (about nine miles from Liverpool), where the railway runs for two or three miles on a dead level.

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First Day, October 6th.

On the morning of trial, five competitors were thus described in the official list of the *running coaches*:—

No. 1. Messrs. Braithwaite and Ericsson, of London; *The Novelty*; copper and blue; weight, 2 tons 15 cwt.

2. Mr. Ackworth, of Darlington; *The Sans Pareil*; green, yellow, and black; weight, 4 tons, 8 cwt. 2 qrs.

3. Mr. Robert Stephenson, Newcastle-upon-Tyne; *The Rocket*; yellow and black; white chimney; weight, 4 tons 3 cwt.

4. Mr. Brandreth, of Liverpool; *The Cycloped*; weight, 3 tons; worked by a horse.

5. Mr. Burstall, Edinburgh; *The Perseverance*; red wheels; weight, 2 tons 17 cwt.

The engine which made the first trial was *The Rocket* of Mr. Robert Stephenson (the son, we believe, of Mr. George Stephenson, the engineer of the railway). It is a large and strongly-built engine, and went with a velocity which, as long as the spectators had nothing to contrast it with, they thought surprising enough. It drew a weight of 12 tons 9 cwt., at the rate of ten miles four chains in an hour (just exceeding the stipulated maximum); and, when the weight was detached from it, went at a speed of about 18 miles an hour. The faults most perceptible in this engine were a great inequality in its velocity, and a very partial fulfilment of the condition that it should "effectually consume its own smoke."

The next engine that exhibited its powers was *The Novelty* of Messrs. Braithwaite and Ericsson. The great lightness of this engine (it is about one half lighter than Mr. Stephenson's), its compactness, and its beautiful workmanship, excited universal admiration—a sentiment speedily changed into perfect wonder by its truly marvellous performances. It was resolved to try first its speed merely—that is, at what rate it would go, carrying only its complement of coke and water, with Messrs. Braithwaite and Ericsson to manage it. Almost at once, it darted off at the amazing velocity of 28 miles an hour; and it actually did one mile in the incredibly short space of one minute and 53 seconds! Neither did we observe any appreciable falling off in the rate of speed; it was uniform, steady, and continuous. Had the railway been completed, the engine would, at this rate, have gone nearly the whole way from Liverpool to Manchester within the hour.

Second Day, 7th October.

The Novelty engine of Messrs. Braithwaite and Ericsson was this day tried, with a load of three times its weight attached to it, or 11 tons 5 cwt., and it drew this with ease at the rate of 20¾ miles per hour: thus proving itself to be equally good for speed as for power, and entirely consuming its own smoke.—The weather now became wet, and the railways clogged with mud, which made it necessary to suspend the prosecution of the experiments before the day had half elapsed.

Third Day, 8th October.

Before the commencement of the experiments to-day, it was announced that the judges, on reconsidering the card of "Stipulations and Conditions" originally issued, and of which we have given the substance, had considered them so defective as to make it necessary to substitute the following:—

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"TRIAL OF THE LOCOMOTIVE ENGINES—LIVERPOOL AND MANCHESTER RAILWAY.

"*The following is the Ordeal which we have decided each Locomotive Engine shall undergo, in contending for the Premium of Five Hundred Pounds, at Rainhill:—*

"The weight of the locomotive engine, with its full complement of water in the boiler shall be ascertained at the weighing machine, by eight o'clock in the morning, and the load assigned to it shall be three times the weight thereof. The water in the boiler shall be cold, and there shall be no fuel in the fire-place. As much fuel shall be weighed, and as much water shall be measured and delivered into the tender-carriage, as the owner of the engine may consider sufficient for the supply of the engine for a journey of 35 miles. The fire in the boiler shall then be lighted, and the quantity of fuel consumed for getting up the steam shall be determined, and the time noted.

"The tender-carriage, with the fuel and water, shall be considered to be, and taken as a part of the load assigned to the engine.

"Those engines that carry their own fuel and water shall be allowed a proportionate deduction from their load, according to the weight of the engine.

"The engine, with the carriages attached to it, shall be run by hand up to the starting-post; and as soon as the steam is got up to fifty pounds per square inch, the engine shall set out upon its journey.

"The distance the engine shall perform each trip, shall be one mile and three quarters each way, including one-eighth of a mile at each end for getting up the speed, and for stopping the train; by this means the engine, with its load, will travel one and a half mile each way at full speed.

"The engine shall make ten trips, which will be equal to a journey of thirty-five miles; thirty miles whereof shall be performed at full speed, and the average rate of travelling shall not be less than ten miles per hour.

"As soon as the engine has performed this task (which will be equal to the travelling from Liverpool to Manchester), there shall be a fresh supply of fuel and water delivered to her; and as soon as she can be got ready to set out again, she shall go up to the starting-post, and make ten trips more, which will be equal to the journey from Manchester back again to Liverpool.

"The time of performing every trip shall be accurately noted, as well the time occupied in getting ready to set out on the second journey.

"Should the engine not be enabled to take along with it sufficient fuel and water for the journey, of ten trips, the time occupied in taking in a fresh supply of fuel and water shall be considered, and taken as a part of the time in performing the journey.

J. U. RASTRICK, Esq., Stourbridge, C.E.
NICHOLAS WOOD, Esq., Killingworth, C.E. } Judges.
JOHN KENNEDY, Esq., Manchester.

"Liverpool, Oct. 6th, 1829."

Nothing was said in the new conditions as to each engine's "effectually consuming its own smoke;" but this omission could only have arisen from oversight: for the Act of Parliament, under the authority of which the railway has been formed, orders imperatively that no engine shall be suffered to ply upon it which does not possess this qualification.

The engine which exhibited on the third day was *The Rocket* of Mr. Stephenson. The trial was conducted in the manner laid down in the

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"Ordeal" we have just quoted; and it was understood on all hands that this trial should be considered decisive of its merits.

The engine, with its complement of water in the boiler, weighed 4 tons 5 cwt., and the load attached to it was 12 tons 15 cwt., or, including a few persons who rode, about 13 tons. The journey was 1½ mile each way, with an additional length of 220 yards at each end to stop the engine in, making in one journey 3½ miles. The first experiment was for 35 miles, which is exactly ten journeys, and, including all the stoppages at the ends, was performed in three hours and ten minutes, being upwards of eleven miles an hour. After this a fresh supply of water was taken in, which occupied 16 minutes, when the engine again started, and ran 35 miles in 2 hours and 52 minutes, which is upwards of 12 miles an hour, including all stoppages. The speed of the engine, with its load, when in full motion, was, at different times, 13, 13½, 14, and 16 miles an hour; and, had the whole distance been in one continued direction, there is little doubt but the result would have been 15 miles an hour. The consumption of coke was on an average about half a ton in the 70 miles.

Fourth Day, 9th October.

To-day a public notice appeared from Messrs. Braithwaite and Ericsson, stating, that in consequence of the alterations made in the conditions of the competition, the trial of their engine in the manner prescribed by the new "Ordeal," had, with the approbation of the judges, been deferred till the following day. The 9th became thus a *dies non* in the competition.

Fifth Day, 10th October.

At the appointed hour this morning *The Novelty* was weighed, and three times its weight assigned to it by the judges. The steam was got up in 54 minutes from the time of lighting the fire. The engine then went one trip by way of rehearsal, when a small pipe accidentally gave way, and it was found necessary to send to Prescot, a distance of two miles, to have it repaired.

In the interval, Mr. Stephenson's locomotive engine was run twice down the course and back, making in all 7 miles, but with the whole load taken off from behind, including even the tender-carriage, with the water-tank and fuel. Thus *stripped for the race, The Rocket* performed the seven miles in the space of 14 minutes 14 seconds, being at the rate of 30 miles an hour! This was a rate of speed nearly equal to the utmost which *The Novelty* had achieved; but as it carried with it neither fuel nor water, it is not a speed which it could have long sustained.

The Novelty, having now had its broken pipe repaired, made several trips, but solely for the gratification of the spectators, and not with any view to a decisive exhibition of its powers. Mr. Vignolles, the engineer, who rode on the engine, and timed it during two of these trips, has favoured us with the following calculation, founded on the results:—

"The maximum number of strokes was 142 per minute, while 440 yards were traversed in 43 seconds. Diameter of wheels, 50·1 inches—circumference, 157·4 inches. 157·4 × 142 equal to 621 yards, being the velocity per minute of the circumference of wheel, or 21 miles and 300 yards per hour. Then as 60 seconds : 621 yards : : 43 seconds : 445 yards."

Thus the calculated distance of the run (considering the wheel as a perambulator) agrees within five yards with the space actually passed over; and this difference might arise from the most trifling inaccuracy of

noting the time—a quarter of a second at each end being sufficient to produce this discrepancy: so that it may fairly be concluded, that there was no slipping of the wheels at a velocity of nearly 22 miles an hour with a load.

Another carriage, with seats for the accommodation of passengers, was now substituted for the loaded wagons attached to *The Novelty*, and about 45 ladies and gentlemen ascended to enjoy the great novelty of a ride by steam. We can say for ourselves that we never enjoyed any thing in the way of travelling more. We flew along at the rate of a mile and a half in three minutes; and though the velocity was such that we could scarcely distinguish objects as we passed by them, the motion was so steady and equable, that we could manage not only to read, but write.

Sixth Day, 13th October.

Mr. Ackworth's engine, *The Sans Pareil*, was pronounced to be this day ready to exhibit its powers. We were informed that, on weighing it, the judges found it to exceed, by two or three hundred-weight, the maximum of six tons: it was, nevertheless, allowed to start to do 70 miles, in the same manner as *The Rocket*, with three times its great weight attached to it—that is, upwards of 1,800 tons. It was soon manifest that a very powerful competitor had entered the field; for two hours *The Sans Pareil* kept going with great regularity, and during that time completed upwards of 25 miles. It went occasionally, when at its utmost speed, a mile in 4 min. 10 sec. and 4 min. 17 sec., being at the rate of nearly 15 miles an hour. While thus bidding fair—if not to win the prize, at least to come in second best—a similar accident happened to it as befel *The Novelty*—one of the feed pipes burst, and it was rendered for the time incapable of proceeding.

Seventh Day, 14th October.

In Messrs. Braithwaite and Ericsson's engine a fresh pipe had, it appeared, been substituted for the one which failed on the preceding trial; one or two other parts of the machinery that were in a faulty state had also been renovated; but the engine, with the exception of some of the flanges of the boiler being (as Mr. Ericson expressed it) rather *green*, was pronounced in a working state. The load assigned to it by the judges was, dropping the fractional parts, 5 tons 16 cwt.

The steam was on this occasion got up to a pressure of 50 lbs. in somewhat less than 40 minutes, and at an expenditure of about 15 lbs. of coke.

The engine now started to do the 70 miles for a continuance; but just as it had completed its second trip of three miles, when it was working at the rate of 15 miles an hour, the new cement of some of the flanges of the boiler yielded to the high temperature to which it was exposed, and it was impossible the trial could go on.

It appears, that after we left the railway on the 14th, Messrs. Braithwaite and Ericsson intimated to the judges, that as the joints of *The Novelty*, which had given way, could not be restored to a working state before the lapse of at least eight days, and the prolongation of the competition was likely to be attended with great inconvenience to many parties, they would withdraw their engine from any further trial, and "leave it to be judged of by the performances it had already exhibited." Accordingly the judges gave in their report to the directors; and the prize of 500*l.* was adjudged by them to Mr. Robert Stephenson, of Newcastle,

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A considerable alteration was afterwards made in Mr. Robert Stephenson's engine, which has greatly increased its powers. It was tried again, when it drew the enormous weight of 20 tons, at the rate of from 18 to 20 miles per hour.

The directors, it appears had no alternative, since *The Rocket* was the only engine which fulfilled the conditions of the competition.

The external view of *The Novelty*, given in the frontispiece, will at once satisfy our readers that it has not been unmeritedly extolled by all who have seen it, for its singular lightness, elegance, and compactness. All locomotive engines have been hitherto so constructed, as to require a separate tender to carry the water and fuel necessary for these operations (we cannot as yet except Mr. Gurney's); but *The Novelty* includes within itself every necessary accommodation for these purposes, and is, nevertheless, much lighter than any engine on the old plan. *The Rocket* of Mr. Stephenson, which is one requiring a separate tender, weighs 4 tons 3 cwt., while *The Novelty* weighs only 2 tons 15 cwt.: making a difference in favour of the latter of 1 ton 8 cwt.

The means by which the inventers of *The Novelty* have been able to combine so much lightness with great power will be understood by reference to the engravings and diagrams of the machines in No. 323 of the *Mechanics' Magazine*.

This engine is mainly indebted for its superior steadiness when in action to a very beautiful arrangement of the springs. The wheels are of the excellent description patented by Messrs. Jones and Co.; and, from the peculiar manner of their construction, they act with the least possible interference from the weight of the engine; and being perfectly cylindrical, bear equally with their whole breadth on the rails. The lightness for which these wheels are famed, is not in this instance so remarkable, *The Novelty* being itself in its main parts so light, as to throw other things in comparison with it into the shade. Of the total weight of 2 tons 15 cwt. we believe 13 cwt. falls to the share of the wheels.

In the specification of the patent which Messrs. Braithwaite and Ericsson have taken out for this mode of generating steam, mention is made of two air-forcing pipes: one by which atmospheric air is forced on to the *top* of the fuel in the furnace; and another through which air is forced under the bottom of the fuel. A double supply of air, however, is only considered necessary where coal is the fuel employed, in order to ensure its combustion more effectually; and where fuel of the purity of coke is made use of, as in *The Novelty*, the upper pipe is dispensed with.*

MR. GURNEY'S IMPROVED STEAM CARRIAGE.

DESCRIPTIONS of Mr. Gurney's carriage have been so often before the public, that extended detail at present is unnecessary.† The recent improvements have been perspicuously stated by Mr. Herapath, of Cranford, in a letter in the *Times* newspaper,

* The details of the respective engines would occupy too many pages of this volume, especially as they appear in that widely circulated miscellany the *Mechanics' Magazine*, whence the frontispiece, and such of the descriptions as we have adopted, have been abridged.

† See Arcana of Science for 1828, page 52.

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and we cannot do better than adopt and abridge a portion of his communication :—

"The present differs from the earlier carriage, in several improvements in the machinery, suggested by experiment; also in having no propellers;* and in having only four wheels instead of six; the apparatus for guiding being applied immediately to the two fore wheels, bearing a part of the weight, instead of two extra leading wheels bearing little or none. No person can conceive the absolute control this apparatus gives to the director of the carriage, unless he has had the same opportunities of observing it which I had in a ride with Mr. Gurney. Whilst the wheels obey the slightest motions of the hand, a trifling pressure of the foot keeps them inflexibly steady, however rough the ground. To the hind axle, which is very strong, and bent into two cranks of nine inches radius, at right angles to each other, is applied the propelling power by means of pistons from two horizontal cylinders. By this contrivance, and a peculiar mode of admitting the steam to the cylinders, Mr. Gurney has very ingeniously avoided that cumbersome appendage to steam-engines, the fly-wheel, and preserves uniformity of action by constantly having one cylinder on full pressure, whilst the other is on the reduced expansive. The dead points—that is, those in which a piston has no effect from being in the same right line with its crank—are also cleared by the same means; for as the cranks are at right angles, when one piston is at a dead point, the other has a position of maximum effect, and is then urged by full steam power; but no sooner has the former passed the dead point, than an expansion valve opens on it with full steam, and closes on the latter. Firmly fixed to the extremities of the axle, and at right angles to it, are the two 'carriers'—(two strong irons extending each way to the felloes of the wheels). These irons may be bolted to the felloes of the wheels or not, or to the felloes of one wheel only. Thus the power applied to the axle is carried at once to the parts of the wheels of least stress—the circumferences. By this artifice the wheels are required to be of no greater strength and weight than ordinary carriage wheels; and, like them, they turn freely and independently on the axle; but one or both may be secured as part and parcel of the axle, as circumstances require. The carriage is consequently propelled by the friction or hold which either or both hind-wheels, according as the power is applied to them jointly or separately, have on the ground. Beneath the hind part drop two irons, with flat feet, called 'shoe-drags.' A well contrived apparatus, with a spindle passing up through a hollow cylinder, to which the guiding handle is affixed, enables the director to force one or both drags tight on the road, so as to retard the progress in a descent, or, if he please, to raise the wheels off the ground. The propulsive power of the wheels being by this means destroyed, the carriage is arrested in a yard or two, though going at the rate of eighteen or twenty miles an hour. On the right hand of the director lies the handle of the throttle-valve, by which he has the power of increasing or diminishing the supply of steam *ad libitum*, and hence of retarding or accelerating the carriage's velocity. The whole carriage and machinery weigh about 16 cwt., and with the full comple-

* The propellers, I am informed, are not absolutely discarded. They are now not fixed, but movable, and reserved for extreme possible emergencies, or for certain military purposes.

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ment of water and coke, 20 or 22 cwt., of which, I am informed, about 16 cwt. lie on the hind-wheels."

Mr. H. then enumerates the principle of the improvements :—

"That troublesome appendage the fly-wheel, as I have observed, Mr. Gurney has rendered unnecessary. The danger to be apprehended in going over rough pitching, from too rapid a generation of steam, he avoids by a curious application of springs; and should these be insufficient, one or two safety valves afford the *ultimatum* of security. He ensures an easy descent down the steepest declivity by his 'shoe-drags,' and the power of reversing the action of the engines. His hands direct, and his foot literally pinches obedience to the course over the roughest and most refractory ground. The dreadful consequences of boiler-bursting are annihilated by a judicious application of tubular boilers. Should, indeed, a tube burst, a hiss about equal to that of a hot nail plunged into water, contains the sum total of alarm, while a few strokes with a hammer will set all to rights again. Lastly, he has so contrived his 'carriers,' that they shall act without confining the wheels, by which means there is none of that sliding and consequent cutting up of the road, which, in sharp turnings, would result from inflexible constraint.

"Hills and loose slippery ground are well known to be the *res adversæ* of steam-carriages; on ordinary level roads they roll along with rapid facility. In every ascent there are two additional circumstances inimical to progressive motion. One is, that carriages press less on the ground of a hill than on that of a plain, thus giving the wheels a less forcible grasp or bite; but this may be easily remedied in the structure of a carriage, and is not of very material consequence in the steepest hills that we have. The other is more serious. When a carriage ascends a hill, the weight or gravity of the whole is decomposable into two—one perpendicular, and the other parallel to the road. The former constitutes the pressure on the road, the latter the additional work the engine has to perform. Universally this is the same part of the whole carriage and its load together, which the perpendicular ascent of the hill is of its length. With these principles, if we knew the bite of the wheels on the road, we could at once subject the powers of Mr. Gurney's carriage to calculation.

"Now, from one of the experiments, made in the barrack-yard at Hounslow, I find we can approximate towards it. For instance, with one wheel only fixed to the 'carriers,' the carriage drew itself and load of water and coke (about 1 ton), with three men on it, and a wagon behind of 16 cwt. containing 27 soldiers. This, at the rate of 1½ cwt. to a man, in round numbers is 4 tons. Estimating the force of traction of spring-carriages at a twelfth of the total weight, it consequently gives a hold or bite on the road of 1-12 of 4 tons, or 6 2-3rds cwt. per wheel, or 13 1-3rd cwt. for the two wheels. This is likewise the propelling force of the carriage. Supposing, therefore, we were ascending a hill of 1 foot rise in 8, which I am assured exceeds in steepness any hill we have, we should be able to draw a load behind of 2 tons 2 cwt., or between 3 and 4 tons altogether. * * * *

"On a good level road, I think it not improbable it might draw, instead of 7 tons, which our experiment would give, from 10 to 11, besides its own weight, or 100 ordinary men, exclusive of 2 or 3 tons for carriages; and up one of our steepest hills, 3 tons besides itself, or 25 men, besides a ton for a carriage. This it would do at a rate of 8, 9, or 10 miles an hour. For it is a singular feature in this carriage, and which

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was remarked by many at the time, that it maintained very nearly the same speed with a wagon and 27 men, that it did with the carriage and only 5 or 6 persons. But there is a fact connected with this machine still more extraordinary. For instance, every additional cwt. we shift on the hind or working wheels, will increase the power of traction in our steepest hills upwards of 4 cwt., and on the level road half a ton. Such, then, is the paradoxical nature of steam-carriages, that the very circumstance which in animal exertion would weaken and retard, will here multiply their strength and accelerate. This, no doubt, Mr. Gurney's ingenuity will soon turn to profitable account.

"It has often been asserted that carriages of this sort could not go above 6 or 7 miles an hour. I can see no reasonable objection to 20. The following fact, decided before a large company in the barrack-yard, will best speak for itself:—At 18 minutes after three I ascended the carriage with Mr. Gurney. After we had gone about half way round, 'Now,' said Mr. Gurney, 'I will show you her speed.' He did, and we completed seven turns round the outside of the road by 28 minutes after three. If, therefore, as I was there assured, two and a half turns measured one mile, we went 2.8 miles in ten minutes—that is, at the rate of 16.8, or nearly 17 miles per hour. But as Mr. Gurney slackened its motion once or twice in the course of trial, to speak to some one, and did go at an equal rate all the way round for fear of accident in the crowd, it is clear that sometimes we must have proceeded at the rate of upwards of 20 miles an hour."

The present arrangement is certainly very preferable to placing the boiler and engine in immediate contact with the carriage, which is to convey goods and passengers. Men of science are still much divided on the practical economy of using steam instead of horses as a travelling agent. One of them, a writer in the *Atlas*, observes, that "if ultimately found capable of being brought into public use, it would probably be most convenient and desirable that several locomotive engines should be employed on one line of road, in order that they might be exchanged at certain stages for the purposes of examination, tightening of screws, and other adjustments, which the jolting on passing over the road might render necessary, and for the supply of fuel and water.

IMPROVEMENT IN RAIL ROADS.

The Chevalier Jos. de Baader, of Munich, announces, through the *Bulletin Universel*, an improved method of constructing rail-roads. He affirms that the inconveniences and present incomplete construction of rail-roads have been the subject of his consideration for twenty years, and that he has at length succeeded in discovering remedies for all the imperfections and obstructions to which they are liable. The advantages proposed by the inventer are in substance as follow:—The grooves so constructed, fixed, and joined, that the wheels may run with the greatest facility, and without any lateral friction; the more solid imbedding of the foundation, and protection to the grooves

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from gravel and other matters liable to be thrown on them by the horses; improved construction of the carriages, and the adoption of a particular mechanism for turning them in every direction, and at any time, and giving them the usual length of other carriages, so that the rail-road may be allowed to follow the windings of any country: the adaption of these carriages to ordinary roads as well as to railways; a contrivance by which they may quit the road at any point, to allow other carriages to pass, or for any purpose. M. Baader also announces the discovery of a new principle by which the carriages may be propelled by stationary steam-engines, erected at certain distances.

These inventions are stated to have been put to the proof on a considerable scale, before the Royal Academy of Sciences, and the Committees of Directors of the Polytechnic and Agricultural Societies of Munich, and to have obtained the approbation of those bodies.

NEW RAIL ROAD IN FRANCE.

Measures are taking to form a rail-road between Andrésieux and Roanne, at which town the Loire becomes navigable. The object of this rail-road is to complete the system of roads and canals established in that part of France, and to perfect the communication between the north and south of the kingdom, from Marseilles and Lyons to Paris and Havre.*

MICROSCOPIC NOVELTIES.

(See the Plate.)

In our last volume we copied from Mr. Gill's valuable *Technological Repository*, a few of the most curious results of Mr. Carpenter's microscopic examinations throughout the year.† This ingenious and indefatigable gentleman has continued his researches during the year just passed, and we have, in like manner, selected a plate of the most attractive subjects, presuming on the gratification of the reader in thus viewing some of the most intricate wonders of Nature developed in a very popular manner; and receiving additional interest, if possible, from their juxtaposition, with a few of the marvels of art contained in this volume.

Fig. 1. *Part of a Centipede, or British Scolopendra*, especially representing the curious manner in which the two main trunks of the arteries serpentine or bend, so as to allow of the greatest freedom of motion in the numerous joints of its body, without straining them. The whole insect is not much more than an inch in length, and yet seems to be furnished with as many parts as the larger kinds found in hot climates. One from Africa is to be seen in the British Museum, which measures nearly 18 inches in length!

Fig. 2. *Tongue of the Horse-fly*, showing the curious arrangement of

* Bull Univ. † See Arcana of Science for 1829, page 2, et seq.

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the parts for sucking, &c.; as likewise the strong hairs, and the muscles by which it is thrust out of the mouth of the fly, and again retracted. Besides the sucking action of the tongue, Mr. Carpenter has recently found, that it has likewise the power of piercing through the skins of fruits, &c. by its strong proboscis from underneath the tongue, and is furnished with stout supporting branches and muscles.

Fig. 3. *Piercer of a Field Cimex or Bug*, proceeding from a flexible organ, somewhat resembling the trunk of an elephant, attached to the head of the insect. It consists of a stout piercer and two flat and slender appendages for opening the pores of the plants which it inhabits. Mr. C. believes the ends to be naturally straight, in their living state, but here shrunk or contracted in drying.

Fig. 4. *Wing-case of the Furze Cimex.* This insect is not larger than a flea; yet the beauty displayed in the structure of its wing-cases is admirable.

Figs. 5 & 6. *Pith of the Rush.* The general structure of this beautiful microscopic object is exhibited in Fig. 5; it being composed of a series of tubes, arranged in triangles, and forming hexagons, grouping into each other with much regularity; and each tube being divided in its middle by a valve. Sometimes, however, the structure differs, as shown in Fig. 6, where several oval forms are intermingled with the former arrangement; other tubes also branch off, which connect the layers underneath and above them.

Fig. 7. *Coat of a seed of the bachelor's button*, a common flower; which when viewed as an opaque object, under highly magnifying powers, present singular and beautiful structures.

Fig. 8. *Part of a Gnat's Wing*, in which the fine ribbed scales, or feathers, which form the fringe or border of it, and some of the others, arranged like the leaves or sprigs of vegetables, are distinctly seen.

Fig. 9. *Part of a grain of sand pierced full of holes by marine Polypi.*

Fig. 10. *Part of a nest of Polypi.*

Fig. 11. *Ten eyes and Fangs of an African Spider.* Of the eyes four are placed in a square cluster in the front of the head; two on each side of the front are affixed in pairs on raised appendages, and two large ones are placed behind the head—a wonderful provision, indeed, both for its defence, and to enable the spider to view and seize its prey. The head is black, but is occasionally sprinkled over with white hairs. This object was drawn as viewed in Mr. T. Carpenter's excellent opaque compound microscope.

Fig. 12. *This Animalcula inhabits the shell of the wheel Animalcula.* Mr. Carpenter saw the egg and the animalcula, as shown in the plate, upon the surface of the leaf of an aquatic vegetable. It protruded its apparatus, and thus caused a motion in the water to bring minute animalculæ within its reach. This apparatus consists of a singularly curved stem, from which numerous fibrillæ proceed. It requires an excellent microscope to distinguish the latter, but Varley's single microscope enabled Mr. Carpenter to discover and delineate them, as shown in the figure.

These descriptions of the curious productions of Nature would belong altogether to another department of this volume (Natural History) were not their wonders developed by the aid of some of the most ingenious of modern mechanical inventions—improved and powerful microscopes.

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SOCIETY OF ARTS.

The annual distribution of the rewards of this Society took place in July last. The prizes were delivered by his Royal Highness the Duke of Sussex, the President, viz.—

1. Mr. J. Vendramini, 14, Brompton-row, for his engraving from the picture by Sebastian del Piombo, of the raising of Lazarus, the large gold medal.—2. Mr. J. Robertson, Worton House, Isleworth, for his improvements in the art of painting in water-colours, the gold Isis medal.—3. Mr. Joseph Neathercliff, 8, Newman-street, for his improved method of making lithographic transfers, £20.—4. Thomas Dowler, M.D., for his musical instrument called the glossophone, the large silver medal.—5. Mr. J. Cuthbert, 5, Purbeck-place, Lambeth, for his stand for an astronomical telescope, the large silver medal and £20.—6. Mr. W. H. Hilton, 10, Regent-street, for his pump for racking wine, the large silver medal.—7. Mr. R. Parvin, 3, Carpenter-street, Mount-street, for his improved French window, the silver Isis medal and £5.—8. Mr. W. Tindall, Leeds, for his wheel with an oblique axle, the silver Isis medal.—9. Mr. W. Aust, Hoxton New Town, for a copper lining to a leaden pump-barrel, £5.— 10. Mr. T. Williams, Lieut. R.N., for his oars to be worked by one hand, the large silver medal.—11. Mr. W. P. Green, Lieut. R.N., for his yoke for a disabled rudder, the silver Isis medal.—12. Mr. W. Rodger, Lieut. R.N., for his Syphon for watering ships, the gold Isis medal; 13. Ditto, for his make-shift anchor, the large silver medal.—14. Mr. E. Carey, R.N., for his method of preventing dry-rot in ship timber, the large silver medal.—15. Mr. T. Reynolds, 13, Arbour-terrace, Commercial-road, for his repeating stop for a naval sextant, the gold Isis medal.— 16. Mr. D. Davies, 15, Wigmore-street, for a fire-escape, the large silver medal.—17. Mr. S. Mordan, 22, Castle-street, Finsbury, for his self-centering lathe-chuck, the large silver medal.—18. Mr. Joseph Clement, 19, Prospect-place, St. George's, Southwark, for his self-acting double-driver for a lathe-chuck, the large silver medal.—19. Mr. James Roberts, 7, Abbey-street, Bethnal-green-road, for his improvements in weaving velvet, £5.—20, Mr. J. Hughes, 93, Sebright-street, Bethnal-green, for his improved cards for weaving figured silks, the silver Isis medal and £15.—21. Mr. C. S. Smith, 3. Kirkman's-place, Tottenham-court-road, for his method of manufacturing melting-pots for iron and steel, £20.—22. Mr. R. Green, 57, Ernest-street, Regent's park, for his draining-plough, £15.—23, Mr. J. Pearson, Frittenden, Kent, for his draining-plough, the large silver medal and £15.—24. Joseph Kirkby Trimmer, Esq., Strand on the Green, Kew, for his flock of improved Merino sheep, the large gold medal.—25. Josias Booker, Esq., Liverpool, for his substitution of machinery in aid of slave labour, the large gold medal.

During the past session the Society have appropriated seven evenings to occasional meetings, for dissertations on subjects connected with the arts and manufactures of the country, illustrated by ancient and modern specimens. Ancient and modern pottery and porcelain occupied the two first evenings; and stereotype founding and printing, casting in plaster of Paris, and the manufactures of glass and paper, have been subsequently discussed.

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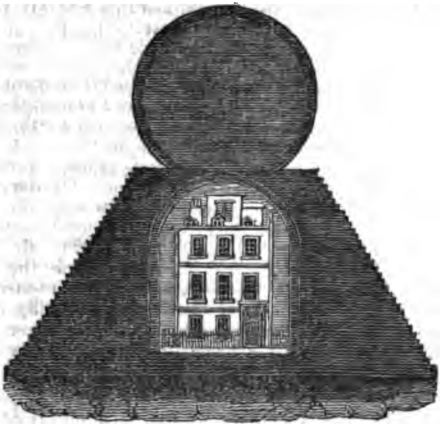
PROPOSED MONUMENT TO SIR ISAAC NEWTON.



"Nature and Nature's laws lay hid in night:
God said, 'Let Newton be,' and all was light."
Pope.

Two or three years ago Mr. Steele, of Magdalen College, Cambridge, circulated a proposal for the erection of a monument to the memory of Sir Isaac Newton. Of this memorial, which was also designed by Mr. Steele, the above is a sectional view. Mr. Steele then addressed a letter to the *Times*, explanatory of the particular object which he had in view in its construction, of which the following is a reprint:—

To the Editor of the Times.

"Sir—If there be any one name which more than another has done honour to England, it is the name of Sir Isaac Newton; and I beg permission to suggest, through the medium of your paper, the means of erecting a monument to him in London, not unworthy of the nation and of his memory.

"When travelling through Italy, I was powerfully struck by the unique situation and singular appearance of the Primitive Chapel at *Assisi*, founded by St. Francis.

"As you enter the porch of the great Franciscan church, you view before you this small cottage-like chapel, standing directly under the dome, and perfectly isolated.

"Now, Sir, among the many splendid improvements which are making in the capital, would it not be a noble, and perhaps the most appropriate, national monument which could be erected, if an azure hemispherical dome, or what would be better, a portion of a sphere greater than a hemisphere, supported on a massive base, were to be reared, like that of *Assisi*, over the *house and observatory* of the writer of the *Principia*? *

* In St. Martin's-street, Leicester-square, London.

"The house might be fitted up in such a manner as to contain a council-chamber and library for the Royal Society; and it is perhaps not unworthy of being remarked, that it is not more than about two hundred yards distant from the University Club House.

"Protected, by the means which I have described, from the dilapidating influence of rains and winds, the venerable edifice in which Newton studied, or was inspired,—that "palace of the soul," might stand fast for ages, a British monument more sublime than the Pyramids, though remote antiquity and vastness be combined to create their interest.

"I have the honour to be, Sir,
"Your obedient servant,
"*******.

"*Magdalen College, Cambridge, Oct.* 15, 1825."

In the plan, a sectional view of which is prefixed, Mr. Steele appears to have contented himself with giving a pictorial form to the excellent general idea expressed in the preceding letter; leaving it to others to whom it more professionally belongs to supply such architectural accessories as an edifice of this kind would admit of. We need scarcely add, that there is no description of embellishment which might not be with ease introduced into the structure, so as to render it as perpetual a monument to the taste as it would be to the national spirit and gratitude of the British people.*

NATIONAL REPOSITORY.

THE second annual exhibition of this Institution was opened on the 1st of March, with a collection of articles for the most part of superior merit to those exhibited last year. Among the machines, apparatus, and implements, especially entitled to mention, are

No. 1 & 2. *The Patent Cosmospherically-mounted Globe, by Major Muller, G. L.*—This improvement consists of a revolutionary alteration in the structure of the celestial, and in the mounting of the terrestrial globes; ingeniously combining the two.

This celestial globe consists of a hollow glass sphere, on which are depicted the stars constituting the various constellations. This sphere is furnished with brass circles representing the equinoxial, the ecliptic, the colures, and the polar circles. The glass sphere separates at the equinoxial into two hemispheres; for the purpose of admitting within it a terrestrial globe, which is manufactured in the usual way. This globe is also furnished with brass circles, which are adjustable to represent at pleasure the meridian and the horizon of any assigned place. The axis of the globe passes through the sphere, and supports both in a strong brass ring, which may be either attached to a stand and made to rest upon a table, or suspended from the ceiling of a room, with a counterpoise.

By the cosmosphere the position of the earth with respect to the fixed stars may be represented at any given time; and by placing on the celestial sphere patches to represent positions of the sun, moon, and planets, the position of the earth with respect to these bodies may also be repre-

* Mech. Mag.

sented with facility. Hence many of the astronomical phenomena arising from the position of the earth with regard to the other bodies can be familiarly illustrated; and numerous useful problems readily solved by the cosmosphere in this form. But to extend its usefulness to other illustrations and solutions, the patentee has made arrangements for removing the globe from the interior of the sphere, and placing in its stead the sun with the planetary system; and by this means the relative positions of the planetary bodies may be interestingly represented. He has likewise provided brass graduated circles, by which, when they are attached to the celestial sphere, the nature of the various astronomical and nautical problems depending on spherical trigonometry may be pleasingly explained. The construction of this apparatus, enveloped in a sphere of glass, and mounted in so curious and novel a manner, forms a singularly beautiful and interesting object.

28. *Self-registering Stamp Press, by John Reilly, of Finsbury Place.*—This is a small screw fly-press, having on the under side of the upper die a small projecting pin, which being forced back at every stroke of the press, acts upon ratchet work or other suitable movements, enclosed in a small case above, and having in front a dial, which registers the successive movements with undeviating accuracy to the extent of 20,000, without requiring winding up. The dial in this machine is left uncovered for the purpose of inspection, but when in actual use it is covered in such a manner as to secure it from all interposition on the part of those employed in stamping. The object of the invention is stated by Mr. Reilly to be, the prevention of frauds in the Stamp Office, which according to the 14th Report of the Commissioners of Inquiry into the Revenue have been very frequent.

32. *Flexible Ear Trumpet, by Mr. J. Hancock, of North End, Fulham.*—This useful instrument is made of Indian rubber, its flexibility renders it the more convenient for portability, or for its ready application in any situation that may be required.

33. *Revolving Platina Light Apparatus, by J. Harley.*—In this instrument "the jet piece revolves so as to throw the flame upon the lamp in front, after the gas is ignited by the heat of the platina. By the same movement of the cock by which this is done, the cover of the platina vessel is removed and replaced. By this improvement of the former apparatus, the cock of which is exhibited along with the article for comparison, this interesting mode of producing instantaneous light is rendered more practically useful."—*Catalogue.*

59 & 60. *Models of Improved Bee-hives, by T. Nutt of Moulton Chapel, Lincolnshire.*—This is a very excellent and valuable invention; the cruel practice of destroying the bees to obtain their honey is entirely obviated by it, and the produce is very considerably increased by the management of the hives and their inmates. The "produce of a single cottage hive, under five years' management on the principle of humanity" is stated by Mr. Nutt in his prospectus as follows:

Pounds.			Pounds.
36	First swarm on the 10th June, 1823		
127	Union of the parent stock,	14th August, 1823 - - -	28
132	Collection of honey - - -	12th June, - 1824 - - -	30
100	- - - - - - - - - -	16th July - 1825 - - -	58
115	- - - - - - - - - -	10th August, 1826 - - -	106
510			222

Pounds.			Pounds.
510			222
98	- - - - - - - - - - -	10th July, - 1827 - - -	219
104	- - - - - - - - - - -	6th August, 1828 - - -	296
712	For the bees' support during five years.	Contribution	737
737	Contribution.		
1449			

"Not a bee was destroyed; one and the same domicile was stationary; and these interesting insects are now so tractable and domesticated by this humane management, that no danger is apprehended by the curious who may make their remarks and hourly observations at the back window of this establishment."

66. *Patent Apparatus for entering Places filled with smoke or noxious Vapours, without danger of Suffocation, by C. Deane of 2, Charles Street, Deptford.*—The apparatus consists of a large helmet, with a leathern garment attached to it, which is to be put over the head and shoulders of the person about to enter an apartment on fire, or that filled with noxious vapours. From the back of the helmet proceeds a long flexible pipe, which extends to the outside of the building or apartment, and through which fresh air is propelled into the helmet for the wearer to breathe, by means of properly constructed bellows, conveniently fixed for operating upon in a wooden box; which box is adapted for the stowage of all the apparatus when not in use, and is sufficiently portable. At the back part of the helmet there is another pipe, kept distended by an internal coiled wire spring, which reaches only to the ancles of the wearer, and is strapped to one of his legs, to prevent inconvenience from its dangling about. The whole of the apparatus must of necessity be air-tight! The helmet is made of copper, nicely riveted, soldered, and tinned on the inside.

159. *Model of a Frigate, with all her rigging and furniture complete.*—This is the finest example of the modelling of a ship that we ever had the pleasure of beholding. An hour or two spent in examining it would not be mis-pent. For accuracy of proportion, and finish in workmanship, even in the most minute details, nothing can surpass it. It is an exact miniature representation in every respect, exterior and interior, of one of the finest ships in the British navy. Every piece of wood or metal is shaped and proportioned after the original; from the cables to the smallest lines the same proportions are observed, with the exact number of strands, &c. By looking through the cabin windows, down the hatchways, and through the port holes, every part of the vessel may be inspected, and the more you examine the more will the interest increase. It must at ordinary wages have cost several hundred pounds in the construction, though the model is only about two feet long.

238. *Terrestrial Globe, by Addison.*—This globe is of the largest size ever constructed in this country, and conveys the most recent geographical discoveries.*

* Abridged from the Register of Arts.

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PRESERVATION OF FIREMEN EXPOSED TO FLAMES.

The Chevalier, and philanthropist, Aldini, of Milan, has lately gathered round him the scientific circles of the metropolis. At the Royal Society he exhibited his anti-caloric apparatus; some experiments also were gone through, which appeared to satisfy as well as to surprise. It was at the Royal Institution, however, where the Chevalier's plans were fully and fairly developed; the first night of the session (Jan. 22, 1830,) having been devoted to a lecture, by Professor Faraday, on this important, and interesting subject.

Mr. Faraday informed his auditors that the Chevalier had succeeded in spinning and weaving the asbestos into a species of cloth, a beautiful specimen of which covered a table in front of the lecturer. This piece, said Mr. Faraday, is the largest that has been manufactured since the days of the ancient Romans, and probably larger than any among them. The body is covered with this material, over which a dress composed of metallic tissue is placed; the latter, or outer covering, intercepts flame, and is nothing more than the wire-gauze of Sir Humphry Davy. With an asbestos glove on his hand, we saw Mr. Faraday—though, as he said, he was a young fireman—grasp red-hot iron for a considerable time: nay, even a heavy piece of that material, somewhat resembling a brick in size, also red-hot, he carried, on the palm of his hand, for several minutes, without experiencing more than a slight degree of heat. But the most surprising feat was left for an Italian fireman, nephew of the Chevalier, we are told. This young man, equipped in an asbestos mask and a helmet of tissue, kept his head, and especially his face, completely enveloped in a stream of flaming gas for six or eight minutes; on taking off his wire helmet and mask, he (coolly) wiped his face, as if he had breathed incense for so many minutes. We never heard applause greater in any scientific assembly than attended this experiment. From what we have said, it will appear that the Chevalier's plan is to clothe firemen, or others, so that they may be able to enter burning habitations, and save human life or valuable property. Half-a-dozen suits, we are told, have been constructed of this material, and are deposited with the municipal authorities of Paris. The Chevalier disclaims all eye to profit; and when we inform our readers that he is now upwards of eighty years of age, and that the best part of this long life has been spent in attempts to disarm fire of its terrors, for the greater safety of his fellow-creatures, we think that the term philanthropist is not misapplied.*

When at Geneva, M. Aldini instructed firemen in the defensive power of his arrangements, and then practised them, before he made the public experiments. He showed them that a finger enveloped first in asbestos, and then in a double case of

* Foreign Lit. Gaz.

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wire gauze, might be held in the flame of a spirit-lamp or candle for a long time, before inconvenient heat was felt; and then clothing them, gradually accustomed them to the fiercest flames.

The following are some of the public trials made:—A fireman, having his hand enclosed in a double asbestos glove, and guarded in the palm by a piece of asbestos cloth, laid hold of a large piece of red hot iron, carried it slowly to the distance of 150 feet, then set straw on fire by it, and immediately brought it back to the furnace. The hand was not at all injured in the experiment.

The second experiment related to the defence of the head, the eyes, and the lungs:—The fireman put on only the asbestos and wire gauze cap, and the cuirass, and held the shield before his breast. A fire of shavings was then lighted, and sustained in a very large raised chafing-dish, and the fireman approaching it, plunged his head into the middle of the flames, with his face towards the fuel, and in that way went several times round the chafing-dish, and for a period above a minute in duration. This experiment was made several times, and those who made it said they suffered no oppression or inconvenience in the act of respiration.

The third experiment was with the complete apparatus:—Two rows of fagots, mingled with straw, were arranged vertically against bars of iron, so as to form a passage between, thirty feet long and six feet wide. Four such arrangements were made, differing in the proportion of wood and straw, and one was with straw alone. Fire was then applied to one of these double piles, and a fireman, invested in the defensive clothing, and guarded by the shield, entered between the double hedge of flames, and traversed the alley several times. The flames rose ten feet in height, and joined over his head. Each passage was made slowly, and occupied from twelve to fifteen seconds: they were repeated six or eight times, and even oftener, in succession; and the firemen were exposed to the almost constant action of the flames for the period of a minute and a half, or two minutes, and even more.

When the course was made between the double range of fagots without straw, the fireman carried a kind of pannier on his back, prepared in such a way as to be fire-proof, in which was placed a child, with its head covered by an asbestos bonnet, and additionally protected by the wire-gauze shield.

Four firemen made these experiments, and they agreed in saying, that they felt no difficulty in respiring. A very abundant perspiration came on in consequence of the high temperature to which they had been exposed; but no lesion of the skin took place, except in one instance, where the man had neglected to secure his neck by fastening the asbestos mask to the body dress.*

* Bibliothèque Universelle.

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ON EXPLOSIONS IN STEAM BOILERS.

By Dr. Thomas P. Jones, Editor of the Journal of the Franklin Institute.

THE following notice of an explosion of a steam-boiler, recently appeared in the Pittsburgh Gazette, and has been republished in most of the papers in the United States;—

"*Explosion.*—On Tuesday night, about nine o'clock, one of the steam-boilers of the Union Rolling Mill, iron works, at the eastern extremity of Pittsburgh, on the Monongahela river, burst, with a tremendous explosion, shot off through the air, at an angle of about 45° with the horizon, and describing a beautiful arch, fell into the river about two hundred yards from the works. The steam being on fire, and issuing from the boiler in a stream of flame, it was beheld with astonishment and admiration by the passengers on board a steam-boat, which had but a few moments before passed the spot where it descended. The furnace, in which four boilers were situated, being placed without the wall of the main building, under a slight shed, and the exploding boiler taking a direction outward of the works, no other injury was sustained, than the present loss of the boiler itself, and the displacing of the three others, which it threw entirely out of the foundations, and beyond the floor on which they were erected. The rolling apparatus alone is stopped by the accident; the hammers and other works were in operation as usual on Wednesday morning."

With respect to the cause of such explosions, there is not, by any means, a concurrence in opinion, even among scientific men; and the manifest importance of the subject, renders valuable every new fact relating to it, which can be established upon incontrovertible evidence. That highly elastic steam will cause a boiler to burst, and that most of the accidents of this kind which occur, arise either from the want of strength in the boiler, or the imprudent confinement of the steam, is admitted on all hands; but it has been believed by many, that in those tremendous explosions which occasionally occur, such as that above recorded, the exploding agent is, in part at least, a mixture of those gases whose bases combine and form water, and that there is an actual combustion of these within the boiler. For ourselves, we have never for a moment entertained such an opinion; and although we have found among its advocates some persons not unacquainted with chemistry, we have never met with, or been able to elicit any admissible rationale of the formation of such a mixture; nor do we recollect, among the accounts of such explosions as have appeared, any one, except the foregoing, which seemed to justify the opinion of a gaseous combustion. Whether the evidence in this case before us, possesses sufficient strength to add probability to this opinion, we shall presently inquire.

Professor Hare, having examined this subject, draws the con-

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clusion, that the production of explosive gases is contrary to the well established principles of chemistry.

From a valuable paper, by Mr. Perkins, on the same subject, we thought that there was great force and consistency in the theory of that gentleman, and we have not yet seen any reason to change this opinion. We do not think it necessary to repeat what was there said, as it is in the hands of our subscribers. Those who feel an interest in the inquiry may turn to it with advantage.*

In the Pittsburgh account, the idea of the burning of the steam, is no more rational than would be the apprehension that it might "set the river on fire." Steam is as incombustible as water; indeed, it is water in an attenuated state. The opinion, that steam itself burns, when water is thrown upon combustibles, appears to be one of those vulgar errors which are the result of trusting too much to the senses; those principal, but often false guides, of the uninformed. When water, in moderate quantities, is thrown upon a brisk and flaming fire, it is converted into steam; which, expanding and mixing with the flame, causes it to spread out into a much larger volume than it would otherwise have occupied, and thus apparently increases the combustion. If it acted in any other way than that stated, the water must be decomposed and recomposed at the same instant; and how, in that case, it could increase the heat, we should be puzzled to tell.

Passing over the statement of the burning of the steam, as only evincing a deficiency in chemical science, which is by no means extraordinary, or disreputable, we can well imagine how the appearance of that combustion was produced, which had it really existed, would have proved the formation of explosive gases within the boiler. We are of opinion that the boiler was heated to redness at one end, and that the meteor-like appearance which it exhibited, was merely the rapid passage of the projected boiler through the air. To the eye, this, like the whirling of an ignited coal, would present a lengthened stream of light, and apparently justify the conclusion, that there was a real combustion.

Had this accident, or any of those similar to it which have occurred on board of steam-boats, been the consequence of explosive gases, a volume of flame would have filled the vessels; linen, and other light articles, would have been set on fire; and persons, instead of being scalded by steam, would have been scorched by fire.

As regards the force of explosion, there is no reason why it should not have been produced by steam alone. If the steam-gun, constructed by Mr. Perkins, should never be brought into actual use, it will have evinced, experimentally, that projectiles may be thrown by the elastic force of dense steam, with a power equal to that of gunpowder. It is not necessary, therefore, in order to account for the effects produced, to resort to any other

* See Arcana of Science for 1829.

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agents than those which are known to be present, heat and water.

If we ever seek to devise means for obviating such accidents as those of which we have been speaking, we must first acquire correct information respecting the facts attending them, and not adopt vague assumptions as admitted truths: we must either proceed upon established principles, or discover reasons for correcting our theory. Before assuming that the ignition of gases is concerned, let us hear how these gases are produced. If the oxygen of the water could be made to combine with the iron of the boiler, the hydrogen would be altogether incapable of producing an explosion, without admitting a large portion of atmospheric air; which air must find its way into a vessel, in which there was a large quantity of vapour and gaseous matter, in a state of tension, and exerting a pressure outward, much greater than that of the external air.

It is believed that these violent explosions take place only when the boiler is without its proper supply of water. If such be the fact, the desideratum is the means of always furnishing this supply; an object which does not appear to present any insurmountable difficulty.

We invite attention to this subject; and particularly desire of those who have studied chemistry, and who advocate the opinion we have opposed, to explain the process by which they imagine a boiler can become charged with oxygen and hydrogen, or any other explosive mixture of gases.

On the same subject Mr. Gill remarks:—There seem yet to be wanting other particulars, to enable us to form an exact idea of the causes and effects of the above-mentioned explosion. For we can have no idea of an entire boiler being projected from its seat to the distance of two hundred yards. We indeed well recollect the explosion of a steam-boiler at Smitherman's saw-mills, in the Borough, many years since; when the top, sides and ends of the boiler were torn away from its bottom, by the force of the explosion, and were projected much in the way above described; and no doubt would also have been thrown as far as in this latter instance, had not their progress been stopped, by their coming into contact with some bags of hops, which were contained in the upper story of a lofty warehouse, and through the roof of which they had made their way. The bottom of the boiler was indeed likewise removed from its foundation, but was only carried a few yards in the same direction with the other parts of the boiler.*

PREVENTION OF FIRES IN THEATRES.

In consequence of the frequent occurrence of fires in theatres, particular precautions have been taken with the theatre of the

* Tech. Repos.

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Port St. Martin, at Paris. A thick wall of hewn stone separates the audience part from the scenic part of the house; all the doors in it are of iron, and may be shut instantly, in case of fire; finally, the insulation of the spectators from the stage is made perfect by means of a screen of plates of iron, which falls down before the stage. This screen, which weighs between 1,200 and 1,300 pounds, is easily worked by two men, and slides up and down upon guides, so as readily to take its place. Besides these precautions, reservoirs of water are established in the roof, which may be connected, when necessary, with vessels of compressed air, and made to throw a powerful jet over a very large part of the building.*

PREPARATION OF HYDRAULIC LIME.

It was observed by M. Lafaye, and confirmed by M. Vicat, that lime which had been slaked by immersion, may be preserved for a long time without alteration.

MM. Ollivier, and M. Vicat, have succeeded in preparing a lime which they can preserve for a long time in sacks, without losing any of its properties, and at the same price with unslaked lime. The use of this lime is said to be very advantageous; it avoids any difficulty in the measurement, and is more easy of transference. Its use in preparing walls for fresco paintings, is superior to all other lime.

It is sold in very fine powder; and, having been sifted, is free from vitreous particles. These operations, as well as the moving it into the sacks, are not at all inconvenient to the workmen, who continue for twelve hours per day thus occupied without injury. From one to one and a half million of sacks of this lime are sold annually, being principally employed in the construction of canals in Bretagne.†

FILTRATION OF WATER.

Mr. Brande, in a recent lecture at the Royal Institution, described the process of filtration as applicable to very large quantities of water, and gave an account of the works lately carried into effect by the Chelsea Company, and shewed a model of their arrangements for the purpose, for which, as well as for the following particulars, he was indebted to Mr. Simpson, the engineer to that Company:—

The pond which contains the filter-bed is forty-four feet square at top, and made with sloped banks, the bottom being twenty-six feet square; it is six feet deep; the mode of forming the bed was as follows:—After the pond was made water tight, with a drain through the bank to the well, the bottom was covered with

* Bull. Univ. † Bull. d'Encouragement.

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coarse gravel, in which drains were built without any cement between the joints of the bricks; they were covered with coarse gravel, and then with finer gravel, with coarse sand and finer sand, until the strata of gravel and sand were each two feet thick, both gravel and sand having been selected with care, and well washed. The reservoirs were each thirty-two feet square at top, twenty feet at bottom, and four feet deep; the low water line of them being level with the high water line of the filter bed; the reservoirs were worked alternately on to the filter bed, and it was regulated to filter 12,000 cubic feet of water every twenty-four hours; and the water was remarkably pure and limpid after it had passed the bed. The silt which was stopped on the bed was regularly cleaned off with a small portion of the sand every fourteen days; the principle of the action depends upon the strata of filtering material being finest at the top, the interstices being more minute in the fine sand than the strata below, and the silt, as its progress is arrested, (while the water passes from it) renders the interstices between the particles of sand still more minute, and the bed generally produces better water when it is pretty well covered with silt than at any other time. The silt has never been found to penetrate into the sand more than three inches, the greatest portion always being stopped within the top half inch of the sand, and in cleaning the silt off, it has never been found necessary to scrape any more of the sand off with the silt than the first half inch depth, and sometimes only half that depth was removed. The small air pipes from the drains are to prevent injury to them or the filtering materials by condensation or otherwise.

The large filter bed at Chelsea is a surface of nearly one acre, and is constructed precisely on the same principle as the experimental bed, the details of forming and working it being greatly improved and adapted to the enlarged scale. The perfecting this bed has been a work which required the greatest attention and perseverance; it was set to work, and supplied the Chelsea Company's district for the first time on the 14th of January, 1829, and is of sufficient capacity to filter 500,000 cubic feet of water every twenty-four hours: it has worked with the greatest success during the inclement season, and although the water on the bed has been covered with ice five inches thick, it did not impede the filtering process.

This filter bed was made after the engineer had seen several similar works upon a small scale in England and Scotland, which have been at work some years, and he has combined in it the several advantages he observed in the filter beds he examined.

It is proposed to follow up the improvement by extending the suction pipe up the river, and pumping the water (during the last two hours of ebb tide only) into small reservoirs constructed close to the filter bed, and the water will be filtered as it is required for the supply of the town, and the main pipes will be so

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constructed that none but filtered water can be pumped into them.

It will be seen by Mr. Simpson's evidence before the commissioners appointed by his majesty to inquire into the state of the supply of water to the metropolis, that the water, by filtration, could be rendered perfectly clear, excepting during extraordinary land floods, when upon a close inspection he had perceived a slight loamy colour in the water after it was filtered, which was scarcely discernible in a glass tumbler. Mr. Simpson now remarks that the water in the large filter bed is much better than it ever was in the experimental bed.*

ALTITUDE OF CERTAIN BUILDINGS.

	metres.
The highest Pyramid in Egypt	146
The Cathedral at Anvers	144
The Cathedral at Strasburg	142
The Steeple of St. Stephen, at Vienne, (Austria)	138
The Steeple of St. Martin, at Landshut	137
St. Peter's, at Rome	132
The Steeple of St. Michael, at Hamboro'	130.5
The Steeple of St. Peter, at Hamboro'	119
St. Paul's Cathedral, at London	109.7
The Cathedral of Ulm	109.4
The Cathedral of Milan	109
The Tower of the Asinelli, at Bologna	107
The Dome of the Invalids, at Paris	105
The Cathedral of Magdebourg	101.6
The Cupola of the Pantheon, at Paris	79
The Balustrade of Notre Dame, at Paris	66

The metre is 39.37 inches.†

SMOKE DISPERSER.

By M. Millet.

A REPORT upon this apparatus, made by M. Derosne, speaks favourably of its powers. The apparatus is simple, consisting of a kind of tub pierced with a great number of holes, having the burs outwards. It has been taken into practice by many persons. In order to prove its efficacy, one of them was fixed on the top of the funnel pipe of a stove, and a very close, smoky fire made below. By means of a ventilator, an artificial wind was then made to strike directly and powerfully on the smoke disperser for the purpose of driving the current downwards and making the stove smoke; but neither by this, nor even additional means, could any effect of the kind be produced. The committee

* Brande's Journ.

† Bull. Univ.

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could not explain the effect, except by supposing that the cylindrical form of the apparatus presenting only a small surface to the action of the wind was favourable, and that the form of the small apertures in this cylinder, occasioning a great number of contrary currents, produced almost a perfect neutralization of the force of the wind. Whatever may be the cause, the apparatus offers a cheap and effectual remedy for smoky chimneys, when this fault in them is dependent upon the pressure exerted by winds upon the upper aperture of the flue.*

BLOCK MACHINERY.

On May 8th, at the Royal Institution, Mr. Faraday described Brunel's block machinery at Portsmouth. There is a set of magnificent models in the possession of the Navy Board, of this admirable invention of Mr. Brunel. They consist of eight separate machines, which work in succession, so as to begin and finish off a two-sheaved block four inches in length. These, upon application from the Royal Institution, were lent by the Navy Board, and were put by Messrs. Maudsley and Field's men (who made them) into such communication and action as to perform the set of operations in the most perfect manner.

Mr. Faraday first gave the general history of the origin of this invention, and of the circumstances connected with the warfare of England with France, &c. &c., under which it was completed. He then briefly explained the particular principle and use of each machine, which at the same time was set to work to perform the operation upon different blocks of wood. He stated generally that the block machinery of Portsmouth, by adjustments, could manufacture blocks of one hundred different sizes —could with thirty men make a hundred per hour; and from the time of its completion in 1804-5, to the present day, had required no repairs from Maudsley, the original manufacturer. The total cost was given at 46,000*l.*, and the saving per annum in time of war 25,000*l.*, after allowing interest for capital, and paying the expense of all repairs.†

ELASTICITY, DUCTILITY, AND STRENGTH OF HAMMERED AND ROLLED IRON.

The following are the principal results obtained by M. Lagerhjelm, with great care, and the use of a very complete and powerful apparatus:—

1st. Rolling always gives the same iron the same uniform density. Hammered bars of the same iron are often of different densities, and frequently contain scales. 2nd. Rolling does not twist the fibre of the bar: hammering sometimes does. 3rd. The measure of elasticity is the same for both hammered and rolled

* Bull. Soc. Enc. † Brande's Journ.

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bars; but the limit of elasticity (measured by the greatest weight which the bar can support for a given sectional surface, without any permanent change of form) is greater for hammered than for rolled bars, if neither have been refolded; but if they have been refolded, the limit of elasticity is increased, and becomes the same for both. 4th. Rolling gives more ductility to iron than hammering. 5th. Cohesion appears independent of the process employed, and is the same for both. 6th. The lengthenings and shortenings (both of which follow the same laws) are not proportional to the forces which draw or compress a bar of iron in the direction of its length. 7th. Elasticity is not changed by tempering. 8th. Very different forces are required to produce the same permanent change of form in a brittle and a soft iron. 9th. The limit of ductility being taken as the length which a bar a foot long will increase by, from the state of unaltered elasticity until the moment of rupture, the most ductile iron experimented with was found to give for its limit of ductility 0.27 of the original length, and 0.722 of the original section. 10th. The cohesion is the same for brittle or soft iron, fibrous or not fibrous: so that the absolute strength of iron appears to depend upon its ductility. 11th. The volume of the metal increases as the bar is drawn apart; and the specific gravity of the iron at the broken surface is less nearly by 0.01 than that of the same iron taken from an unaltered part of the bar. 12th. When the iron is extended, preparatory to its fracture, heat is evolved; the heat is greater for soft than harsh iron. Sometimes a bright spark appears at the moment of rupture.*

ENAMELLED STREET NAMES.

Recently the names of the streets in Paris have been put up on enamelled plates, the ground being blue and the letters white. The substance on which the enamelling is performed is lava in slabs, and its use was suggested by the Count de Chabrol. The prepared tablets have been submitted to Brard's test, and also to great differences of temperature, without suffering injury. The same substance (lava) has since been used as the basis of certain enamelled designs; it is much superior in some points to porcelain in this application, because the necessary exposure to fire does not cause it to crack in the manner that porcelain does, and which often, with the latter substance, is followed by the destruction of the artist's work.†

STEAM BOATS.

The fifth Report of the Select Committee of the House of Commons on steam-boats, from June, 1822, after narrating the va-

* Bull. Univ.

† Journ. de Paris.

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rious steam-boat experiments of Mr. Hull, in 1736; the Duke of Bridgewater, Mr. Miller, of Dalswinton, the Marquess de Jouffroy, in 1781; Lord Stanhope, in 1795; and Mr. Symington, on the Forth and Clyde canals, in 1801, says, "still no practical uses result from any of these attempts. It was not till the year 1807, when the Americans began to use steam-boats on their rivers, that their safety and utility were first proved. But the whole merit of constructing these boats, is due to natives of Great Britain! Mr Henry Bell, of Glasgow, gave the first model of them to the late Mr. Fulton, and went over to America with him, to assist him in establishing them. Mr. Bell continued to turn his talents to the improving of steam apparatus, and its application in various manufactures about Glasgow; and in 1811 constructed, *the Comet* (the first practical steam-boat in Europe) to navigate the Clyde, from Glasgow, to Hellensburgh, Greenock, Inverness, &c.*

CANAL LOCKS.

The construction of locks is not yet, perhaps, brought to that degree of perfection, of which it is susceptible. An easy passage for the boats, durability, and the least possible expense of water, seem to be the principal ends to be had in view in forming locks. Some of the locks on the most celebrated canals, built a century or two ago, are very deficient in some of these particulars. Such, for example are those on the canal of Languedoc, that noble work which unites the Atlantic to the Mediterranean. These locks are oval, or, in some instances, in a circular shape, in the plan; forms adopted, from a false idea, that the pressure of the earth behind the walls, would thrust them inwards, the consequence of this form is, that a large quantity of water is lost on the passage of every boat. The effect of the earth to overthrow walls built straight on the horizontal line, has been proved by the permanence of subsequent works, built in this manner, to be of no great amount, when they are properly constructed. The wall should always be built of masonry, if, indeed, iron should not eventually be introduced. The profile, or figure given to the lock, as represented by a cross section, is of great importance; as on this, the stability of the walls, in a great measure, depends. The walls should retreat, or batter, as they rise, the batter being more considerable at the bottom, and decreasing as the walls ascend; at their summit they should become nearly vertical. An inverted arch, sprung from the bottom of each wall, gives them an admirable support, preventing them from sliding inwards, and against this it is necessary to have some guard.†

* Liverpool Mercury. † American Journ.

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CHEAP AND SIMPLE CRANE.

Mr. Gill saw this crane in a cotton warehouse several stories high, at Manchester. It consisted of what is termed a rag-wheel, or a wooden wheel of six feet in diameter, around the rim of which were driven, at equal distances, a number of pieces of iron, made in the form of the letter Y, and around and between the forks of which pieces of iron an endless rope or cable was passed, that descended from the uppermost room, where the crane was fixed, through all the other rooms to the ground floor, so as to be accessible in them all, and thus to raise or lower any goods, by means of a rope or chain, which was wound upon a smaller barrel, affixed upon the same axis with the great wheel, and to which rope or chain the goods were hung. A similar rag-wheel is also made considerable use of, in raising or lowering the various machines employed in the scenery, &c. of theatres; and it is highly deserving of being employed in many other cases.

EXPANSION OF VAPOUR.

By Richard Tregaskis, Esq., of Perran, near Truro.

Experiments on the elastic force of vapour in contact with water at high temperatures are attended with difficulty, considerable expense, and some danger. Hence few experiments have been made on steam beyond the temperature of 343° of Fahrenheit under a column of mercury. Even at this temperature steam supports a column of mercury 20 feet in height.

The great difficulty attending experiments above this height (which is equal to eight atmospheres) renders it particularly desirable that some correct method be given for the calculation of force by temperature, founded on accurate experiments made below it.

Temperature and force increase, it is believed, in some geometrical progression, but their ratios respectively have not been published;—perhaps they are not known. If they increased in the same ratio,—if double the sensible heat would generate exactly double the force,—there would be no difficulty in calculation. But as the increase of force and temperature are very different, a different ratio is required for each factor, and the corresponding terms in each series should point out the relative temperature and force.

In order to this, some known fixed point is necessary for the commencement of the scale. But zero of vapour, like that of temperature, has not been fixed. The freezing point of water, or rather the melting point of ice, naturally presents itself as the zero of vapour; but it has been placed lower on high authority. Yet if the vapour of water has no existence till fluidity is produced, it follows that the commencement of fluidity is low enough; for ice must be liquefied before it can be vaporized.

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With this in view, I have examined various experimental results on the elasticity of vapour, and compared the column of mercury supported with the temperature required to maintain vapour of sufficient tension to support the column. The result of this comparison is, that ONE-FIFTH added to any given portion of heat already communicated to water, as indicated by the thermometer from the freezing point, will double the elastic force of its vapour. The annexed table is calculated on this principle, and the calculation agrees well with experiment from 30° below the boiling point up to 343° of Fahrenheit, the highest experiment hitherto published. This law is easily reducible to a geometrical ratio for each factor. The ratio of force being 2, we have only to reduce 14 to the decimal 1.2 for the ratio of temperature. Having found the ratio, it is easy to calculate the force of vapour at any given temperature, and *vice versâ*, (provided the same ratio answers, while vapour retains the same physical condition, which I think will not be questioned, viz. from the freezing point upward till vapour is changed into permanent gas.) For, by counting the number of terms in each series produced by the continual multiplication of both factors by their respective ratios, the corresponding temperature and force is seen at once. For example,—

	1st.		2d.		3d.		4th.
Temp.	180×1.2=		216×1.2=		259.2×1.2=		311.04.
Force,	30× 2=		60× 2=		120 ×2		=240

And by adding 32 to either of the terms in the series of temperature, we have the degree of Fahrenheit. For instance, at the fourth term we have for temperature 311°.04, force 240.—311°.04+32°=343°.04, so that the force of vapour by calculation at 343°.04 of Fah. supports 240 inches of mercury, and at 343°.6 of Fah. it supports 240 inches by Mr. Southern's experiment.

From this it appears that the calculation answers Mr. S.'s experiment to the fraction of one degree on 343°. The fourth line in the annexed table is nearly a mean between the experiments of Ure and Southern. The third agrees with that of Dr. Ure to a small fraction. The next term under the boiling point agrees to the fraction of an inch with Mr. Dalton. And M. Betancourt's statement, that vapour at 182° has half the tension at 212°, agrees with the table exactly.

It will be observed that the experiments I have selected are in that part of the thermometric range which is most satisfactory, viz. from 182° upwards. In experiments near the freezing point, where one degree does not produce an increase of force equal to the 1-140th part of an inch, the result must be almost inappreciable. It may not be unworthy of remark, that there are only twelve terms in the series from the bottom of the table up to the temperature which Dr. Murray states to be equal to red-hot iron, fully visible in daylight,—a temperature which will change va-

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pour into permanent gas; so that this table, which reaches the utmost limit of vapour, has only 12 terms, 5 of which (almost half the table) have been proved by experiment.

Table of the Elastic Force of Vapour.

Distance from the freezing point.	Additional degrees required to double the Force of Vapour.	Degrees on Fahrenheit's Scale.	Inches of Mercury.	Atmospheres.
150°		182°	15	½
	30°			
180		212	30	1
	36			
216		248	60	2
	43			
259.2		291.2	120	4
	52			
311.04		343.04	240	8
	62			
373.248		405.248	480	16
	74			
447.897		479.897	960	32
	90			
537.477		569.477	1920	64
	107			
644.972		676.972	3840	128
	129			
773.967		805.967	7680	256
	115			
928.760		960.760	15360	512
	186			
1114.512		1146.512	30720	1024

Comparison with Experiment.

	Temp.		Force.
Dalton,	182°	=	15.86 inches of mercury

In this all agree.

Ure, - -	248.5	=	60.40.
{ Ure, - -	290	=	120.15.
{ Southern, -	293	=	120.
Southern, -	343.6	=	240

One practical advantage to be derived from the calculation of force by temperature is the application of a thermometer as a check on the safety valves of steam-engines. Many persons, not naturally timid, are unwilling to venture on board a steam-vessel through fear of its blowing up.

A naval officer, distinguished for bravery, told me not long since that he would never trust his life in the hands of a careless fellow, who, by throwing a pocket-handkerchief on the lever of

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a safety-valve, might blow up the vessel. Prejudice of this kind might be removed and real danger prevented, by means of a small steam-pipe carried from the boiler to a thermometer properly graduated in the cabin. The force of steam in the boiler would then be apparent to the passengers, and the most timid be released from apprehension of danger. A table for that purpose is easily calculated.*

TWO CIRCULAR INSTRUMENTS ANSWERING THE PURPOSES OF SLIDING-RULES.

Mr. Bevan, civil engineer, has invented the following very portable and convenient substitutes for the sliding-rule.

In a circular plate of brass, of about three inches in diameter, a cavity was formed deep enough to receive another thin circular plate within it, and having a flat rim around its face, with logarithmic divisions formed upon and around it, corresponding with those upon and around the face of the circular plate. Both plates had likewise central holes, into the larger one of which a steel stud was firmly affixed, having a short cylindrical stem formed upon it, on which the smaller or movable plate turned. A groove was also formed around the upper part of this stem, into which the forked end of a thin steel spring was fitted, which was secured to the movable plate by screws; and, springing outwardly, it produced a proper degree of friction to retain the movable plate at any required situation, and also prevented it from coming off the steel stud.

This instrument was very portable, and completely answered its purpose.

On mentioning this circumstance to Mr. S. Downing, he immediately showed Mr. Gill another circular instrument of the same kind, which was made by a Mr. Lamb, an ingenious workman as a watch-maker, of his acquaintance; this instrument was smaller and lighter than Mr. Bevan's, and was formed of a circular plate, with a cylindrical rim, accurately fitted by springing, into a circular ring, with a groove inside it, like a spectacle-frame; and such was the great nicety of the workmanship, that the plate turned in its frame with a proper degree of steadiness to enable it to remain in any required position. By this construction, not only great lightness was obtained (a very desirable thing,) but it likewise afforded a facility in forming logarithmic divisions on both faces of the instrument, as in a double and triple ratio for instance; whereas Mr. Bevan's instrument can only admit of receiving one series of divisions upon it. Both are, however, exceedingly valuable instruments; and we must ever consider any facilities which can render these expeditious, portable, and convenient *ready-reckoners* more generally employed than at present, as highly serviceable; and the more especially since Mr. Bevan

* Brewster's Journ.

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has furnished us with the means of rendering them serviceable in a great variety of ways little thought of by the world in general.*

THE MARINER'S COMPASS.

The following is the specification of a patent, obtained in the United States, for an improved mode of fixing the mariner's compass, by Mr. Lemuel Langley, dated May, 1828. Lemuel Langley, of the town of Norfolk, in the state of Virginia, has invented an improvement in the mode of fixing the mariner's compass, which is described in the words following:—

"The object of my improvement is to dispense altogether with the binacle, in which the compass is ordinarily fixed, to cause it to answer all the purposes of a tell-tale, and to secure it against accidents from cannon-shot, the shipping of heavy seas, or any other cause of injury. The mode in which these ends are attained, is by cutting a hole through the deck of the vessel, at or near the place where the binacle is usually situated; this hole is cut through into the cabin, and within it is placed the compass with its box, suspended in the usual way; and when so situated, it is completely out of the reach of cannon or other shot. In order to cause it to act as a tell-tale, the compass-box is made with a glass bottom, so that the card can be seen as perfectly in the cabin as upon deck. I also make the compass-card translucent, or semi-transparent, in consequence of which it may always be lighted from below, and will be much more plainly seen at night than when lighted in the ordinary way. The compass is defended at top by a very thick piece of glass; such as I have used has been three-fourths of an inch in thickness, and this is also defended by a rim or band, projecting above the deck; the lower side of the box is also glazed; and I contemplate sometimes making the sides of the box of glass, should it be desirable to admit light in that way.

"What I claim as new in the above described invention, is the fixing of the compass entirely within the planking of the deck of a vessel; and the mode of rendering it equally visible, both upon deck and in the cabin.

LEMUEL LANGLEY."

Dr. Thomas P. Jones, editor of the *Franklin Journal*, observes, we have seen but few things better calculated to answer the intended purpose than the foregoing invention. Whilst the deck of the vessel remains, the mariner's only guide, the compass, is perfectly secure. The small projection, which it has been thought best to give to the glazed rim, may be completely protected from cannon shot, by a wide plate of iron fixed around it, so as to rise a little higher than the rim, whilst its edges are level with the deck.

* Gill's Tech. Repos.

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A British vessel was in the port of Norfolk, when Mr. Langley was fixing one of his compasses on board a United States vessel, the captain of which preferred it very much to the costly binacle and tell-tale with which his own ship was furnished; there is but little doubt, therefore, that we shall see the invention patented in England, as it is not there required that the patentee should be the inventor.

LIGHTNING RODS.

In consequence of the powder magazine of Bayonne having been struck by lightning, the French Minister of War submitted certain questions to the Academy of Sciences on the subject. The conclusions of the report drawn up by the Section of Natural Philosophy of this eminent body deserve much attention.

The powder magazine of Bayonne, be it observed, was vaulted below the surface of the ground to exclude wet, and vaulted above to resist the effect of shells: so it might be compared to a hollow sphere, the interior of which would be difficultly accessible to the lightning; the comparison would be still closer, had it been cooled with hydraulic lime, so as to preclude the damp from penetrating.

1. The lightning injured the powder magazine at Bayonne, only because the lightning rod with which it was provided was badly constructed, the communication between it and the ground being insufficient.

2. A lightning rod may be rendered fully efficient by making it penetrate deeply into water or damp earth; by burying the horizontal part of it; by covering it with ashes from an oven instead of charcoal imperfectly carbonized, and by directing a stream of water toward the subterranean part of the conductor.

3. That for powder magazines it is prudent to erect the lightning rod on a mast beside them.

4. That in the case of magazines vaulted above and below like that of Bayonne, and from which masses of metal of any considerable size are excluded,* it is unnecessary to employ lightning rods.

5. But in the case of magazines not so vaulted, like those for temporary purposes, prudence requires the use of a lightning rod attached to a mast.†

USE OF PLUMBAGO INSTEAD OF OIL IN CLOCKS AND CHRONOMETERS.

It is well known that the gradual change of oil, when applied as a lubricating medium to those parts where friction takes place in clocks, watches, and other fine mechanical arrangements, has induced numerous persons to endeavour so far to purify the oil as to prevent or retard the injury occasioned to the going of the

* The commission remarks that the ordinary iron work of a building, hinges, locks, cramp irons, staples, need not occasion any fears.

† Brande's Journ.

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machine as much as possible. Mr. Hebert appears to have overcome this difficulty all at once by discarding the oil altogether; and using instead well prepared plumbago. He first prepares the plumbago by repeatedly grinding and washing it over, by which means the gritty particles that occur, even in the best black lead, are removed, and which, if allowed to remain, would neutralize every advantage the pure plumbago is found to give. This done, the prepared substance is applied with a camel-hair pencil, either in the state of powder or mixed up with a drop or two of pure spirit of wine. It readily adheres to the surface of a steel pivot, as well as to the inside of the hole in which it runs, so that the rubbing surfaces are no longer one metal upon another, but plumbago upon plumbago. These surfaces, by their mutual action, speedily acquire a polish only inferior to that of the diamond, and then the retardation of the machine from friction is reduced almost to nothing, and wear and tear from this cause is totally prevented. An astronomical clock of Mr. Hebert's own making, of which the pivots, and holes, and teeth of the escape wheel had been covered on their rubbing parts with fine plumbago fourteen years before, was taken to pieces by a committee of the Society of Arts and examined; the surfaces of plumbago were found to be for the most part unbroken and highly polished, and neither the pivots nor sockets appeared, on examination with high magnifiers, to have undergone the slightest degree of wear.*

USES AND IMPROVEMENT OF CAST-IRON, &c.

A GREAT deal yet remains to be done, to improve the quality of iron castings in this country. But the demand for them, such as they are, is yet too great, to expect the furnace-owners and iron-masters to give much attention to experiments for this purpose. The perpendicular mode of casting, is very far from being common, at the furnaces in this vicinity; although it undoubtedly possesses advantages which should lead to its universal adoption. The strength of a bar as has been ascertained by experiment, cast perpendicularly, being to that of one cast horizontally, as 1,218 is to 1,166; while it is much less liable to air-bubbles, and imperfections of that kind, which render abortive the skill and calculations of the machinist. This superiority is not, as might be supposed from the terms employed, the effect of mere position, but of the pressure of the upright column; and if this is increased by a weight of extraneous metal, the casting is still more likely to be sound. This principle has even lately been carried to the extent, of compressing the fluid castings by mechanical means.

Cast-iron has usually been divided into three kinds; the white, grey, and black. But as these pass into each other, in every de-

* Trans. Soc. Arts.

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gree, so it often happens, that some castings do not bear the character of any one of the above kinds more than another. The white iron is hard and brittle; and it does not seem to be well understood to what this is to be attributed; while the black is soft and tender, and bears all the marks of containing too great a quantity of carbon. The grey iron, or gun-metal, as it is sometimes called, is superior almost for every purpose; it is sufficiently soft to yield to the file, and it is much stronger than either of the other kinds.

Cast iron, when used in machines, or for buildings, should never be subjected to a weight or pressure which will produce a permanent alteration of its figure, or a set, as it is called by the workmen. As this can only take place from a change of the relation which the ultimate particles have to each other; small additions to a force, which is sufficient to produce this change, will be sufficient to increase it, until the relation is destroyed altogether. Although this may be taken as a principle, yet there is some limit in its application, depending on the shape and size of the bar, the kind of iron, and the direction of the force. It seems true of some bodies, particularly of those of a crystalline or vitreous structure, that if strained, or if their particles are once separated beyond a certain point, the separation becomes complete. This point, corresponds with that of their power to recover their former relations or distances, or the elastic power of the body. In these, no permanent alteration of figure can be produced; for a fracture is the consequence of any force which destroys the elastic power. The hard kind of iron approaches this structure, and there is one considerable advantage in using it, which is, that it breaks immediately if it break at all. Whereas, with the softer kinds, which will bear a permanent alteration of figure, the fracture may not take place until the force has continued to operate some time. But if a force be applied to this iron, sufficient to produce such alteration, and be continued for a long time, or if the direction of it be continually changing, as is often the case in machines, a fracture will at length be the result. Much, however, depends on the shape of the bar, and the direction of the force, where that is constant. As, in a bar, to which the force is applied transversely; if the iron be soft, the particles can undergo some change in distance beyond their elastic force, without losing their cohesive attraction. In this case, those particles that are situated in the middle of the bar, do not undergo any strain, until the bar is somewhat curved; when an additional force is sustained by those particles, as this curvation is produced, and before the particles situated outside are strained to the fracturing point. But in cases where the direction of the fracture must be at a right angle to the direction of the force, the principle first stated, namely, that the force applied should not be sufficient to produce a permanent change of figure, may be taken.

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as true. This indeed seems like going too much into the dark abyss of ultimate atoms; but as the facts above stated will be acknowledged so we hope to be excused for the manner in which we have connected them.

In forming iron castings to bear a transverse strain, it is common to increase their depth to several times their breadth; it having been generally understood, that the strength is as the square of the depth multiplied into the breadth. But, by the experiments of the late celebrated Mr. Rennie, (*Phil. Trans.* part I, 1828,) this rule was not found to hold in a bar of the depth of four inches, and the breadth of a quarter of an inch, although it held nearly up to this proportion; and that gentleman thought it evident, that the system of deepening had been carried nearly to its limits.

Mr. Rennie's experiments were made with an apparatus well calculated to give correct results. They show the power of iron to resist compression; its power to resist a twisting force; and its tenacity, when the force is applied to the bars in the direction of their axis, and when applied at right-angles to that direction.

His experiments to find the power of iron in resisting compression, gave the following results. Cubes, of one-eighth of an inch, taken from the middle of a large block, were crushed with a weight of 1,440lbs. And, what may seem somewhat anomalous, in several trials on specimens having the same area as the preceding, but an increased height, the force required to crush them was increased. Cubes of one quarter of an inch, were not crushed with a force less than 10,351 lbs. on an average; as might be expected, the power of resistance is not as the area, but advances by a more rapid progression.

Mr. Rennie relates but two experiments on cast-iron to ascertain its power to sustain weight when directly suspended from the ends of bars. These were made with bars of one quarter of an inch area, and gave a mean of 1,193 lbs. equal to 19,088 lbs. per inch. By the experiment of Mushenbroëk, a bar of one inch area, will sustain 63,286 lbs. Mr. Rennie found that bars of one quarter of an inch, square, having one end fixed in a vice, and a lever three feet in length, applied in a proper manner to twist them, were capable of sustaining about 9 lbs. on the end of the lever. His experiments on the strength of bars to resist a force applied transversely, gave the following results. A bar, one inch square, with supports two feet eight inches apart, broke under a weight of 1,086 lbs. With the supports one foot four inches apart, a bar of the same size broke under 2,320 lbs. A bar two inches deep, half an inch thick, and two feet eight inches long, broke with 2,185 lbs.; and with the supporters one foot four inches apart, it was again broken with 4,508 lbs. Triangular prisms, a cross section of which contained the same area as the

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foregoing pieces, were fractured with 1,437 lbs. when one of the angles was placed uppermost, and with 840 lbs. when the angle was downwards, the supports in both cases being two feet eight inches distant. Bars, three inches deep, and one-third of an inch thick; and four inches deep, and one quarter of an inch thick, required weights of 3,588 lbs. and 3,979 lbs. respectively, to fracture them, when the supports were two feet eight inches apart. Such were the experiments of Mr. Rennie. He also repeated the paradoxical experiment of Emerson, and found it true; that in triangular prisms, where the force is intended to act on one of the sides, the prism becomes stronger by having the portion containing its opposite angle cut away; that is, a part is stronger than the whole!

We shall end this paper by a statement of the comparative power of a few different metals to sustain weights by suspension, according to Mr. Rennie's experiments: all his bars being one quarter of an inch square:

A cast-iron bar, horizontal, sustained - -	1166 lbs.
A ditto, vertical - - - - - - -	1218
A cast-steel bar, previously tilted - - -	8391
A blister-steel bar, reduced by hammering -	8322
A shear-steel bar, ditto - - - - - -	7977
A Swedish iron ditto, ditto - - - - -	4504
An English iron ditto, ditto - - - - -	3492
A hard gun-metal bar - - - - - -	2273
A wrought-copper bar - - - - - -	2112
A cast copper ditto - - - - - -	1192
A fine yellow brass bar - - - - - -	1123
A cast tin bar - - - - - - - - -	296
A cast lead bar - - - - - - -	114*

FORCE OF RUNNING WATER.

A few facts and observations on the power of running water, have been communicated to the Geological Society by Mr. Culley, one of its fellows. The heavy rains which fell during three days of August, 1827, swelled to an unusual height the small rivulet called the College, which flows at a moderate declivity from the eastern water-shed of the Cheviot Hills, and caused that stream not only to transport enormous accumulations of several thousand tons weight of gravel and sand to the plain of the Till, but also to carry away a bridge then in progress of building, some of the arch-stones of which, weighing from one half to three-fourths of a ton each, were propelled two miles down the rivulet.

On the same occasion, the current tore away from the abutment of a mill-dam, a large block of greenstone porphyry, weighing nearly two tons, and transported it to a distance of a

* Boston Journal of Science.

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quarter of a mile. Instances are related to occur repeatedly, in which from one to three thousand tons are in like manner removed to great distances in one day; and the author asserts, that whenever 400 or 500 cart-loads of this gravel are taken away for the repair of roads, that one moderate flood replaces the amount of loss with the same quantity of rounded debris.

Parallel cases of the power of water are stated to occur in the Tweed, near Coldstream.*

ON THE SOLIDIFICATION OF PLASTER.

By M. Gay Lussac.

Every one knows the property which plaster possesses, when deprived of its water by heat, of becoming solid with that fluid. The consistency which it acquires is very variable, and the purest plasters are precisely those which acquire least hardness. The cause has been attributed, in Paris plaster, to the presence of a few hundredths of carbonate of lime; but, without doubt, erroneously; for the heat necessary to bake the plaster is, in the small way, not above 300° F., and, in the large way, is never carried to the degree necessary to decompose the carbonate of lime. Besides, calcined plaster rarely contains free lime, and the addition of that base to those plasters, which have but little consistence, does not sensibly improve them. I think that we must search for the difference of consistency, which is acquired by different plasters, when mixed with water in the hardness which they possess in their natural uncalcined state; a hardness which we cannot explain, but must take as a natural fact. That stated, I suppose that a hard plaster-stone, having lost its water, will acquire greater consistency when returning to its first state than a plaster stone naturally softer. It is in some degree the primitive molecular arrangement which is reproduced. We find, in the same way, that when good fused steel has its carbon removed by cementation with oxide of iron, it will give, by a new cementation with carbon, a steel much more homogeneous and perfect than that obtained in the same circumstances by the cementation of iron.†

DESTRUCTION OF VERMIN IN SHIPS BY STEAM.

By letters from India, it appears that the application of steam has been found wonderfully efficacious in cleansing ships from vermin, and especially the white ant. A steam-boat (the *Comet*) was placed alongside a merchant-vessel, and steam from its boilers conveyed by a very simple system of pipes into the hold of the latter, the apertures to which were closed as well as they could be. The operation was continued for several hours; and

* Phil. Mag. † Ann. de Chim.

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there is no reason to believe that it was not effectual, and will prove a valuable process in the navy. Besides the direct object of cleansing the ship, another advantage accrued, from the discovery of every leaky place existing, by the oozing of the water through them, in which way leaks were made manifest, that could not be found out otherwise. The expense is said to be very moderate; and it is further stated to be the only process at present known, not even excepting sinking, which effectually destroys the white ant.

CONSTRUCTION OF FIRE-PROOF BUILDINGS.

By Ignatius Bonomi, Architect.

One great, and perhaps the principle cause of the destructiveness of fires in large buildings, is the want of arched surfaces of incombustible materials. This has been disastrously exemplified in the destruction of the choir at York Minster, where the roofs of the aisles, which are solidly arched with stone suffered no injury; while the choir-roof, although much more raised above the action of the fire, has been entirely destroyed by it; and there is little doubt but that the whole roof of the church would have suffered the same fate, if its continuity had not been interrupted by the walls of the tower.

The use of arched surfaces of solid materials cannot be too strongly recommended. In no part of our church-architecture is the skill of the contrivers so conspicuous, as in the art employed in the construction of the vaulting, in order to procure strength and reduce the lateral pressure, which they effected by a frame-work of store, of sufficient depth, converging towards the points of support, and by filling in the intervals with thinner material. They thus imitated the structure of the vegetable leaf, in which the fibres centre upon the stem, as the ribs or framework of the arch on its support; at which point, also, the buttress meets the ribs, to counteract the lateral thrust.

In many instances, to render the construction lighter, surfaces of brick are used between the stone ribs; and, where extreme lightness is required, hollow pots (cylindrical within) of well-burnt clay, would prove an excellent substitute for bricks. The uses of these were not unknown to the Romans, who also employed pumice; this porus material possessing the additional advantage, when combined with good cement, of rendering the arched surface one united petrification, opposing (in consequence of its firm union) little lateral pressure, comparatively, against the sustaining walls.

A very frequent occasion of fire is the frequent necessity for the repair of lead gutters, which requires the use of braziers on the roof. This necessity would, in a great degree, be obviated by the adoption of gutters of cast iron, or of solid lead cast in troughs, and having spouts at proper intervals to carry off the

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water. The action of the sun upon gutters, which by expanding the metal, is the principal cause of their failure, might also be much diminished by a thin covering of stone or slate, sufficiently perforated for the percolation of water. This contrivance would also have the advantage of preventing the lodgment of snow, which is apt to freeze in the gutters and occasion the water to overflow, to the damage of the building, and particularly to the timbering of the roof.

Another cause of fire is, the use of roofs of timber, especially when connected with the roofs of other buildings. In such cases the substitution of iron for wood would afford security; and if, in the use of iron, care is taken to make the rise or pitch of the roof sufficient to prevent indirect strains, and to *tie in* the feet of the main supports or triangles, there can be no danger of failure, provided the strength of the iron is proportioned to the weight it has to carry. If, however, the building has an arched under-roof of solid materials, and care is taken to prevent the necessity of continual repairs to the lead-work, the danger of fire, even from a roof of timber, is very considerably obviated. In adverting to the use of a substitute for wooden roofs, it may be proper to specify that in some instances the slated surface might be carried upon *cross walls*, supported by the arches and divisional works of the building.

The means which may be recommended for securing such valuable collections of books or works of art from destruction by fire, are, in the first place, to use *incombustible materials* in the construction of the buildings containing them; and, secondly, to subdivide these collections into suites of separate rooms, which may be connected by wide and high *doors of metal*, rendered ornamental by plates of bas-relief, made to open upon pivots, and poised with mechanical skill, so as to be easily moved. By these precautions, should a fire unfortunately destroy the contents of any one room, it might be prevented from extending to the adjoining apartments.

It is not here intended to enter further into the details of construction; or to refer to the use of arches upon cast-iron beams and sheets of metal, &c.: but it is desirable to explain, that an excellent surface for interior finishing may be obtained, by using (instead of lath and plaster) a lining of brick detached from the exterior walls. This not only affords a security against fire, but has the additional advantage of interposing a medium of air between the inner and outer walls, which, by its slow conducting power, will prevent the interior of the building from partaking of the variations of the outer atmosphere, and consequently, in cold weather, will avoid the precipitation of moisture on the inner walls. To conclude, the examples afforded us in the ancient buildings of our own country, and those of Rome, present to the architect's contemplation a source of study on the subject of solid vaulting, in which, however dissimilar the forms, he will

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discover the application of the same mathematical principles of construction, combining strength, lightness, and economy of material.*

ASCENT OF HOT AIR THROUGH TUBES.

A VERY extensive series of experiments have been made on the velocity with which hot air ascends through tubes, the object being to ascertain the principal points which are necessary to be considered in the construction of chimneys: for this reason, the experiments were made as much as possible to resemble the state of things in actual flues, and the results are in consequence directly applicable, and of an increased value. The account of the whole is published, in a *Traite de la Chaleur*, 2 vols. 8vo., and also in the *Annales de l'Industrie*, ii. p. 110. The conclusions, for which only we have room, are as follow:—

1. The tunnel or flues oppose a resistance to the motion of hot air through them, in the direct proportion of the length of the tunnel and the square of the velocity, and inversely as the diameter. 2. The co-efficiency of friction is not the same for different substances. 3. On contracting the upper orifice, the velocity of the air at the orifice increases to a certain limit, which is the velocity due to the pressure existing in the lower part of the tunnel. 4. On contracting the lower orifice, the quantity passed diminishes only in the proportion of the diameter of the orifice, and, consequently, the velocity in the orifice itself increases in the inverse ratio of its diameter.

The two last results will have numerous applications in the arts. A powerful draught is often indispensable, and is always useful in economizing the fuel. Up to this time, only two elements of draught have been considered,—the height of the chimney, and the temperature of the hot air; but the height is increased only at a serious expense, and to increase the temperature of the air requires the consumption of fuel. From the facts stated in the memoir, it appears that the diameter of the chimney is also an important element of draught; limited when the upper orifice is constant, but indefinite when that is free, and costing but little in construction. Thus, by augmenting the diameter of chimneys, and leaving the upper orifice free, or of a constant diameter, an increased draught may be obtained even when the temperature of the ascending column is diminished.†

CONSTRUCTION OF VITRO-CRYSTALLINE OBJECT GLASSES.

ACHROMATIC object glasses for telescopes are constructed usually of two or more lenses, some of which are of flint glass, the others of crown glass, the achromatic effect depending upon the arrangement of two different media, possessing different dispersive

* Brande's Journ. † Ann. de l'Indus.

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powers. The scientific world is well acquainted with the endeavours which have been made, for years past, to improve the heavier of these two glasses, namely, the flint glass. In the mean time, M. Cauchoix, of Paris, has been engaged in examining the improvement which might be effected by replacing the crown glass, and at last confidently recommends rock crystal for this purpose; by the use of which, he says, he can, with the same magnifying power, augment the light, and diminish the length of the telescope, without much increasing the price of the instrument.

By comparing the best telescopes of Dollond, made in 1758, of three and a half inches aperture and forty-two inches focal length, with what may be obtained by using rock crystal instead of crown glass, he concludes that the length may be shortened to twenty-eight inches three lines, and even to twenty-five inches, by the use of Guinand's glass, at the same time that the same magnifying power is obtained, and the clearness or quantity of light augmented. In terrestrial telescopes, a still greater reduction than this may be effected, amounting even to one half the whole length, and one eighth of the diameter.

The hardness of rock crystal, although it will make more work necessary, will, at the same time, secure the telescope from injury, as it will always replace the external glass: and so, whilst it resists itself, the wear and tear of use will protect the soft glass within. As to the difficulty of obtaining pieces of sufficient size, M. Cauchoix thinks that, when a demand is created for them, they will be found and brought into the market. He has actually constructed an instrument of thirty lines clear aperture and eighteen inches long, which has been substituted with great advantage for another of twenty lines in aperture, and equal length attached to a theodolite. Stars are seen by the former, which were not visible with the latter. He has also constructed a great number of smaller size, many of which having been tried both on land and at sea, have been found equally efficient with ordinary telescopes of double their length.*

ZENNECK'S PYCNOSCOPE,

Or Instrument to Measure the Density of Solid Bodies.

THIS instrument consists of a cylindrical glass vessel, surmounted by a plate and a graduated glass tube. The cylinder must be six or seven times larger in diameter than the tube, and is to be closed above by a ground flat plate of glass or metal, which may be applied to the edges of the cylinder with pomatum, so as to render the junction perfectly air and water tight. This plate has a hole in the centre to receive the tube, which is also to fit accurately. A ring or plate of lead is also to be provided,

* Ann. de l'Industrie.

to be put upon the plate, and prevent it from rising when the apparatus is filled with water. A glass vessel or flask is to accompany this apparatus, competent to hold an equal quantity of water with the cylinder. When this instrument is to be used, the substance, whose specific gravity is to be examined, is to be put into the dry pycnoscope, its weight ascertained, and then the measure of water poured in. The height to which this rises in the graduated tube, shows the volume of the body under examination; which, with the weight, gives the specific gravity.*

IMPROVEMENT IN FIRE ARMS.

It is proposed by M. Burel to fix a small mirror, 0.47 of an inch, in the side, near the mouth of the piece, so that the person using it shall see the reflection of his own eye. In this way it is supposed that very exact aim may be taken; and the experiments made by various officers and sportsmen seem to encourage the idea that this application may be useful. It is considered as most likely to prove serviceable when applied to war pistols.†

INCREASE OF THE BRITISH IRON TRADE.

(From the French.)

The commerce in iron, that precious help to labour, is a sort of scale by which we may estimate the progressive or retrograde states of the manufactures and agriculture of Great Britain, both in regard to its foreign commerce, and the national consumption of it. The progressive improvements in manufactures and commerce are in the direct ratio of their prices; the public interest, nevertheless, requiring that its high price should be limited, when it has too rapidly increased, on the one hand, renders it difficult and even impossible to execute the numerous national internal demands, and those of foreigners, on the other hand; and, indeed, the raising its price too high, obstructs the means of sustaining a competition with foreigners.

There is little fear that this limit should be exceeded, when we see, that for several years, the high prices have been proportionate to the demands for cast and wrought iron, for making water-pipes and gas-pipes, for iron railways and carriages, for steam-boats, iron bridges, viz. either solid or suspension bridges, iron cables, steam-engines, and other innumerable machines of this kind. We may form some idea of these demands when we learn, that a single iron rail-way, and its appendages, to be constructed between Liverpool and Manchester, will cost nearly two millions of francs! And lately, orders have been given for four hundred wrought-iron wheels for the wagons, and two hundred axle-trees. The rail-ways which have been planned, and the execu-

* Kastner's Archives. † Bull. d' Encourag.

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tion of which has already commenced in several places, will require the employment of iron to the amount of 28,000*l*. sterling. The one hundred and eleven miles of communication between Liverpool and Manchester, will finally demand 6,000 tons of this metal, value 80,000*l*.

The demand and the price will always preserve their just proportions; and although they in some degree suffered in the commercial crisis of 1825, yet this national manufacture, and the demand for foreign supplies, have greatly increased. It will no doubt be agreeable to our readers to present them with a table of the progress of this trade, and which owes its existence to the employment of pit-coal, the prime element of the manufactures and the wealth of England.

England and Scotland did not possess, in 1740,* more than fifty-nine high furnaces; their number has since increased in the following proportions:

In 1740,	59	furnaces produced	17,000 tons.
1788,	85	-	68,000
1796,	112	-	125,000
1806		-	250,000
1820		-	400,000
1827,	284	-	690,000

It is in the following counties, and in these proportions, that this prodigious quantity is manufactured.

Staffordshire	95	furnaces, produced	216,000 tons.
Shropshire	31	-	78,000
South Wales	90	-	272,000
North Wales	12	-	24,000
Yorkshire	24	-	43,000
Derbyshire	14	-	20,500
Scotland	18	-	36,500
	284	furnaces, yielding	690,000 tons.

The rapid increase of iron rail-ways, so favourable to the working of coal and iron mines, has proportionally increased the number of iron-works in Scotland. The city of Glasgow, in 1789, had but one single foundry, whose products did not exceed 12 tons per week. In 1817, this city and its precincts possessed 23, yielding 1,200 tons of iron castings at the least.

We believe that about seven-tenths of this total fabrication, is destined to form iron-castings, and nearly the whole is consumed in the three realms; France and America taking but a small proportion: the three other tenths are converted into bar and sheet iron, steel, &c., and form one of the principal branches of exportation to America and the Mediterranean. The mean annual amount of the exportation of iron and steel, in bars and wrought

* It was in this year that the pit-coal was first tried for the purpose of extracting cast-iron from its ores; it began to be generally used in 1750.

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works, is from 1,200,000*l.* to 1,500,000*l.* The single article of bar iron, was entered, in 1826, at 87,724*l.* It is to be remarked, that the importation of bar iron, is principally from Sweden, and amounted to 226,526*l.*; and we see, from the increase of the duties, that its price was raised, in 1824, nearly from 27*l.* to 28*l.* per ton; whilst that of the English bar iron did not exceed 13*l.* The exportation of iron and steel, from 1824 to 1827, increased from 851,578*l.* to 1,107,724*l.*; whilst the exportation of wrought-iron and steel goods fell from 214,000 quintals to 192,000. The increase in the export of the unwrought metal of 250,000*l.* in three years, announces a proportional increase in the manufacturing industry of other people.

To give some idea of the importance of these establishments, we shall cite that of Cyfartha, at Myrthir-Tidrryl, in Glamorganshire. It belongs to Messrs. Crawshay and Co. Its annual product is 11,000 tons weight of pig-iron, and 12,000 tons of iron in bars. A steam-engine, of the power of fifty horses, and a water-wheel, of 50 feet in diameter, work the cylindrical blowing-machines, which are indispensably necessary in the use of coke, and the other machinery of the works. This enormous water-wheel is kept in motion by the pressure of 25 tons of water per minute. The establishment employs from 1,500 to 2,000 workmen, forming, with their families, a population of 4,000 persons. The sum total of their wages amounts annually, to, from 70,000*l.* to 80,000*l.*

The price of iron, which, during the war, was always sufficiently high, has fallen prodigiously since the peace. It was raised, in 1823, from 7*l.* to 13*l.* per ton, for the best qualities of bar iron; the iron in pigs, rose from 4*l.* 10*s.* to 8*l.* 10*s.* and even 11*l.* per ton; the bar iron varied from 9*l.* 10*s.* to 13*l.*, and even to 18*l.* 10*s.* per ton. The mean actual price is 9*l.* 10*s.**

COHESION OF IRON AND STEEL.

According to the experiments of M. de Mittis, a bar of good Styrian iron, one inch square, was broken by a weight of 400 quintals; a similar bar of Styrian steel, not hardened, was broken by a weight of 749.53 quintals; a third and similar bar of the meteoric steel, from the manufactory of M. Fischer, at Hainfeld, in Austria, was broken by a weight of 1130 quintals.†

ENORMOUS BLAST.

It is stated in an American Paper, that in the progress of cutting the Delaware Canal, four kegs of gunpowder, containing about 100 lbs. were lately used for a single blast, and had the effect of rending in pieces more than 400 cubic yards of rock. "This," it is added, "is the largest blast ever made in the United States."

* Journ. des Connaissances Usuelles.

† Kastner's Arch.

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SHARPENING KNIVES.

Mr. de Jongh, of Manchester, has recently made an important discovery with respect to the sharpening of knives. "The best mode", he says, "of sharpening a knife, is to draw it over the surface of a suitable stone, or emery-coated substance, from heel to point, in such lineal directions as forms an angle of forty-five degrees with the breadth of the knife. By moving a knife laterally, and in contact with a revolving stone, in the usual way, the desired grinding lines are obtained. But an evil exists in this and other modes of sharpening knives—the edge is always more or less turned contrary to the grinding side. To obviate this, I have found out, that if two stones are turned in contrary directions, their peripheries, slightly touching each other, and the knife drawn at right angles with the stones at about the place where they touch, and being prevented, by a fixed rest, from being drawn *betwixt* the stones, it will most effectually, and in the best way, be sharpened."*

IMPROVED PAVEMENT.

The whole of the Poultry, and part of Cheapside, have been re-paved. The method there employed was, to remove all the old stones, and a considerable portion of the soil beneath them. A firm bed was then made with broken granite, in pieces similar to those used in Macadamizing, levelled with coarse gravel. Upon this new stones, nicely cut (technically called sovereigns), about fourteen inches long, by four wide, and nine inches deep, were carefully laid down, the gravel filling-in hitherto used being omitted. When a considerable portion had been so far finished, a quantity of thin mortar cement was plentifully distributed over the stones, and urged into the crevices between them by repeated sweeping. The paving was then well rammed, and fine gravel strewed over it completed the process. Although this, like all other *good* work, is in the first instance expensive, yet a most beautiful road has been obtained; and, from its increased durability, it will eventually prove cheaper than the clumsy method hitherto employed.

GEOGRAPHICAL CARPETS.

A correspondent of the *Mechanics' Magazine* makes the following ingenious suggestion for Geographical Carpets:

I think a carpet is so admirably adapted to geographical instruction, that it may be almost said to be a natural article for the purpose. A map is a picture of the surface of the earth, and on the ground is the place to view it. One on so large a scale as a carpet would admit is calculated to give a more correct idea of the relative position of places than could be effected by the

* Mechanics' Magazine.

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largest map now extant. A family in the daily occupation of a room furnished with such a carpet, would acquire unavoidably a more permanent knowledge of a given portion of the earth than could be obtained by any other means; and when the local position of the room would admit, it might be placed agreeably to the bearing of the compass, and it would thereby give a correct idea of the real direction of the places on the map.

A moderately sized carpet would admit very distinctly of a fair representation of all the counties of England, or all the kingdoms of Europe. Perhaps a minute delineation of places could not be admitted, but an outline of the different counties and their names, in the case of England, would be sufficient to give a general and correct idea of the kingdom, and of the relative or contiguous position of each county. General marks, as the spire of a church, to denote the situation of the country town, darts to denote the direction of a river, and many other general features of a map, might be introduced without adding much to the complication of the design; and each county or kingdom might be rendered more distinct by giving it a different colour, as in other maps now in common use. A portion of the coasts of France or Ireland would likewise be of great advantage.

Such a representation of any part of the world, being continually in view, would give children a more correct and permanent knowledge of the geography of such places than any references to maps or globes in common use; and would be more frequently glanced at, as there would be little or no trouble attending it.

NEW STOCK AND SHANK PAINTER.

Mr. W. Warner, a shipwright of Portsmouth dock-yard, has invented a new Stock and Shank Painter, which secures the anchor to the ship's bows, without the possibility of its giving way, and by which one man may let go both painters at the same instant: thus avoiding the necessity of hanging it to the cat-head (a practice usually observed), and which, if a ship pitches heavily, is always liable to do some damage. Lord Yarborough's yacht, the *Falcon*, and H.M.S. *Galatea*, are both fitted according to this improved mode.*

TO MEASURE THE HEIGHTS OF BUILDINGS BY SHADOW.

Make a mark at the extremity of the shadow, and measure a foot of the shadow; at which hold a walking-stick, or any other kind of rod of sufficient length to exceed the shadow; the extremity of the shadow on the rod will be in proportion to the foot measured; and the distance from the rod to the object to be measured must be calculated by this shaded part of the stick, which will show the number of feet the object is high.†

* Portsmouth Paper. † Mechanics' Magazine.

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SITTING IN THE AIR ACCOMPLISHED.

An exhibition at Madras has excited considerable curiosity. A Brahmin, old and slightly made, represented to be of high caste, contrived to poise himself in a most extraordinary manner, in the air. He performed this feat at any gentleman's house—not for money, but as an act of courtesy. The following is a description, from an eye-witness, given in a Calcutta paper:

"The only apparatus seen is a piece of plank, which, with four pegs, he forms into a kind of long stool; upon this, in a little brass saucer or socket, he places, in a perpendicular position, a hollow bamboo, over which he puts a kind of crutch, like a walking-crutch, covering that with a piece of common hide. These materials he carries with him in a little bag, which is shown to those who come to see him exhibit. The servants of the house hold a blanket before him; and when it is withdrawn, he is discovered poised in the air, about four feet from the ground, in a sitting attitude—the outer edge of one hand merely touching the crutch, the fingers of that hand deliberately counting beads—the other hand and arm being held up in an erect posture. The blanket was then held up before him, and they heard a gurgling noise, like that occasioned by wind escaping from a bladder or tube; and when the screen was withdrawn, he was again standing on *terra firma*. The same man has the power of staying under water for several hours. He declines to explain how he does it, merely saying he has been long accustomed to do so."

The length of time which he can remain in his aërial station is considerable. The person who gave the above account says that he remained in the air for *twelve minutes*, but before the Governor of Madras he continued on his baseless seat for *forty minutes*. Great efforts, it is said, have been made to discover the trick, but in vain: large sums, it is added, have been offered to the man to exhibit in England, which he declines. The Calcutta *Government Gazette* contains a conjectural solution of the mystery. The writer observes, first, that, preparatory to the performance, four or five of the Brahmin's followers, or attendants, enclose him in a large thick blanket, so as to afford him room enough for freedom of action, and prevent observation from the most scrutinizing eye. The performer takes about fifteen minutes to divest himself of corporeal weight and the principle of gravitation, and render himself fit for the aërial enterprise. At a signal the blanket drops, and the conjuror is beheld sitting cross-legged in the air. He then explains the contrivance by which the feat is performed. "It is simply a rod of metal, running from the top of the bamboo, along the arm, to between the shoulders; from thence, either a continuation of the metal, ending in a sort of seat, like a buggy step, or a ring large enough to sit upon, may be employed, or straps may be readily contrived to answer

the same purpose. This simple apparatus may be concealed from the spectators in the hollow bamboo, or under the Brahmin's clothes—for he was well supplied with parti-coloured silken raiment, more than enough to hide the trifles required for the occasion. In fifteen minutes he could undress, fix on the apparatus, and dress again; for, standing upon the stool, his arm extending to the bamboo would be in a horizontal position; and the height of the seat not being higher than his middle, he would only have to draw up his feet under him to be ready for public view. The gurgling noise under the blanket alluded to, after the display, may have been produced by introducing the materials into the hollow bamboo, or imitated as part of the trick. The apparatus above described may, of course, be modified and simplified, as to construction and material, according to the skill and dexterity of the performer." *

IMPROVEMENT ON THE HYDROSTATIC PRESS.

The Hydrostatic Press has not been found to answer by bookbinders so well as simple beating, the fault complained of being that it does not expel the air—that in beating, the instrument used does not fall with such uniform pressure on the edges and outside of a book as the press does, and so leaves more room for the air to escape. A Correspondent of the *Mechanics' Magazine* proposes, therefore, that the press be made in a very trifling degree convex, whereby the air would be gradually pressed from the centre to the openings between the leaves and escape.

HOW TO WEAR SPECTACLES.

In the proper use of spectacles, there is no circumstance of more importance than their position on the head. They should be worn so that the glasses may come as close to the eye as possible without touching the eye lashes; they must also be so placed that the glasses may be parallel to the paper when held in an easy position; to accomplish this, let the sides of the spectacles bear upon the swell of the head, about midway between the top of it and the ear; the eyes will then look *directly* through the glasses to the paper, and make the most advantageous use of them, instead of looking *obliquely* through them to the paper, as in those cases still so numerous, where persons place the sides of their spectacles in contact with, or very near, their ears—in which position they produce a distorted image on the retina. The sides of the spectacles should also be placed at an equal height upon the head; and the hands being applied to the *points* of the sides, will generally direct their equal height, as well as allow of their opening to their full extent without injury. †

* Mechanics' Magazine. † Adams on the Human Eye.

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THE BASIN IN THE GREEN PARK.

The Basin in the Green Park, one of the Chelsea Water-works Company's reservoirs, has undergone a complete defecation and repair, preparatory to the reception of the filtered water—of the mode of purifying which we gave an account in a previous article.* It comprehends a surface of about two acres, and is surrounded by brick walls, five feet six inches high, with a stone coping on the top of them: upon which iron railing, about three feet high, will be fixed, as a protection to the public resorting to the esplanade or path round the basin. The bottom of the basin inclines from the walls to the centre about two inches in every foot, and is paved with bricks set on edge. In the centre of the bottom is a brick culvert or open channel, built with an inclination of five feet from end to end of the basin—that is, from east to west; communicating at the east end with the main well, which receives the supply of water previous to its being delivered into the basin; and at the west end with the discharging tank, which communicates with the King's Scholars' Pond Sewer, in the Green Park, opposite White Horse-street, for the purpose of emptying the reservoir. The depth of the basin, from the top of the coping to the foot of the slopes, is fourteen feet, and the culvert is two feet deep at the eastern end, and five feet at the western end of the reservoir. The two wells at the eastern end of the reservoir contain the sluices and apparatus for admitting the water. In that under the trees near Piccadilly, a very ingenious contrivance regulates the column of water in the main as the engineer requires, and the necessity of the old unsightly pipe which used to supply the basin at the western end has been superseded. At the south-west angle of the basin there are four wells, which contain the sluices and valves for letting off the water to the houses in different parts of the Westminster district. The valves are self-acting, and let the water into the mains immediately the engines at Chelsea cease working; and the mains are so arranged that they will be constantly charged with water in all the Westminster and Pimlico districts, both night and day. The supplies, too, will be distinct and independent, where the levels of the ground are dissimilar. At each of the four angles of the reservoir, it will be observed, there are openings in the walls; these communicate with tanks intended to receive ingulfing sluices, which will be worked to take off any soot or other substance which may be blown into the basin; the intention being to sweep the surface of the water daily, by passing a close net or hair-cloth over it, towards any angle of the reservoir the wind blows to. The arrangements are such, that the emptying and washing out the basin may be effected with the greatest facility. The culvert being connected to the discharging well at the western end, the water will run through the pipe to

* See page 28 of the present volume.

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the King's Scholars' Pond Sewer, as before stated; the water from Chelsea being pumped up rapidly, the velocity of the current in the culvert will be sufficient to wash away any impurity contracted by the water in the reservoir. Adjoining this discharging well is a trap conduit, which will effectually prevent any effluvia passing from the sewer to the reservoir. All the wells are fitted with gratings, and covered with thick York stone landings, in which man-holes are cut; and the whole of the wells have round iron bars built in the angles, which form convenient and secure ladders under the man-holes.

It will be perceived, that as the water is to be admitted at the eastern end of the basin, and drawn out at the western end, it cannot become stagnant. The elevation of this reservoir is about 45 feet above high-water mark; and its available contents for the service of the houses amount to about 25,000 tons, which quantity will be pumped up every four days. The draught mains are fixed at ten feet from the top of the water, or at about two-thirds the depth of the basin.

The reconstruction of this reservoir has been carried on under the immediate direction and control of Mr. Simpson, the engineer of the Chelsea Water-works. In the details of the plan, practical men will at once discern many important improvements. The sluices, valves, and apparatus, are all of a superior and novel description, and the whole work well worthy of inspection. No machinery is perceived above ground, although there is every thing necessary to work the water with facility.*

CURIOUS CLOCK.

The Turret Clock at Brocklesby, the seat of the Right Hon. Lord Yarborough, made about the year 1727, has pallets which act similarly to those which have recoiling pallets. This clock has two dials; and the workmanship of it is so exquisite, that though it has been going more than a hundred years, no one would suppose, by looking at it, that it had gone more than a few months, every part being as perfect, in appearance, as when first made, although the striking weight is sufficiently heavy. The pallets are made of lignum vitæ; but not having any friction, and, of course, no wear, they are precisely the same as at first; and must continue so for a thousand years, provided the clock be taken care of, and kept going. This clock goes without oil, and, consequently, never needs to be cleaned; the wheels are all oak, except the pallet-wheel, which is brass; the pinions are all brass, except the last in the going train, concentric with the pallet-wheel, which has lignum vitæ rollers turning on brass pins. The pivots, also, are all brass, and the bushes in which they move are all box-wood, except the pallet's axle, which has brass fulcra resting on glass. The weights are wound up once a week.

* Abridged from the Mechanics' Magazine.

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EXPERIMENTS IN PROPELLING AND TOWING SHIPS OF WAR.

The following experiments were made at Portsmouth, in the course of May last:

Experiment First.

The *Galatea*, of 42 guns, Captain Charles Napier, C.B. was propelled out of harbour by the use of paddle-wheels, worked with winches by the ship's company. At five minutes before nine in the morning she slipped her moorings, half an hour before high water, the flood running one knot. The ship's company, consisting of 190 men, were separated into three divisions; and a trial was first made with *two* divisions, who performed eleven turns of the paddle-wheels in a minute, and propelled the ship at the rate of two and a half knots. The winches were then manned with all the *three* divisions, when the speed of the paddle-wheels was increased to nearly thirteen revolutions in a minute, equal to three knots an hour. On hauling round the buoy of the Spit, the breeze freshening from the westward, the wheels were unconnected, and sail was made, when the paddles were allowed to go round, without impeding the ship's progress. The men were at no time allowed to work up to their strength; and, with a full crew, the *Galatea* could have gone nearly four knots.

Experiment Second.

The next experiment made was to try the propelling power of the *Galatea's* paddle-wheels, contrasted with the power of boats in towing ships. The *Briton* was towed by her own boats and those of the *Pallas*, and stood to the westward. When she was about half a mile a-head, the *Galatea* started, and very soon got alongside of the ship in tow. She paddled up on the *Briton's* larboard quarter, ran across her stern, hauled upon her starboard side, passed ahead of her, fired a broadside. and then returned to her anchorage. The *Briton* was towed at the rate of two knots two fathoms; the *Galatea* was propelled at the rate of three knots.

The result of both experiments was conclusive in favour of the paddle-wheels, and showed, in a very striking manner, the advantage that would be gained by the use of them on board of ships of war, in all cases of calms, or unfavourable winds.

STABILITY OF CANOES.

An interesting paper on this subject, by Mr. Walker, Master R.N., was lately read before the Royal Society. Mr. Walker assumes, as a principle, that the stability of a floating body is a maximum, when the part immersed in the fluid is equal to half its magnitude; or, which is the same thing, when its total weight is half that of the fluid which it would displace by complete submersion. He then proceeds to investigate the case of a canoe,

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supposed to have no stability in itself, and connected by an outrigger with a balance-boat at a certain distance; and shows that the power of such a boat, in preventing the oversetting of the canoe by the action of a horizontal force applied to the sails, is greatest when its weight is exactly half an equal volume of the fluid. Boats with outriggers, he observes, are admirably adapted for velocity: for they are enabled to carry a press of sail without ballast—they displace little water, and move near the surface, where the resistance is less than at a greater depth. The application of a ballast-boat by an outrigger has, however, the disadvantage of tending to turn the prow of the canoe towards the wind—an inconvenience which the experienced Indian obviates by making one side of his canoe nearly a plane, so that the oblique influence of the fluid on the prow is balanced by the resistance of the boat; and the flat side of the canoe being always turned to leeward, presents a greater resistance to lee-way, and very little to going a-head. Mr. Walker then notices the case of a double canoe, or one composed of two equal and similar canoes, joined together by one common deck, and shows that the same general proposition, respecting the conditions of the maximum of stability, applies to the double as well as the single canoe.*

DOUBLE STEAM-BOAT OF IRON.

A STEAM-BOAT has been built at Liverpool, for the canal between Limerick and Dublin, which is made entirely of iron, and is of a very peculiar construction. When seen out of the water, it has exactly the appearance of two vessels joined together by the deck, but separated in every other respect. The paddles, instead of being at the sides, are placed in the middle between the vessels, so that in working they will not injure the banks of the canal, which has hitherto been the principal obstacle to steam-boats being employed in canal navigation.

NEW STOVE.

MR. ELSOM, an Englishman, in Brussels, has obtained a patent for a very elegant, yet simple piece of mechanism; consisting of a handsome polished steel stove, with a chimney formed of tubes, which slide one into the other, in the same manner as the joints of an opera-glass. The stove can thus, with the greatest ease, either be drawn into the centre of an apartment, or be moved, at pleasure, to any intermediate space from thence to the aperture of the chimney. Hot air ventilators, which open and close at will, regulate the temperature of the room. This simple, yet ingenious invention, has given great satisfaction to the higher classes of Brussels.†

* Mechanic's Magazine. † French Journal.

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PORTABLE HORSE MILLS.

The horse is attached to the extremity of a cast-iron lever, which puts in motion a large horizontal wheel, the upright axis of which is sunk into the earth, and having a groove around its rim, which is armed with points of iron; these points enter the links of a chain, which passes around the great wheel, and through two cast-iron trunks, or tubes, which are buried in the earth, under the horse-walk; this chain very conveniently communicates the motion to any distance, and in any direction required; and either of each may be varied *ad infinitum*, without much loss of time, or the employment of any considerable quantity of materials. This is, however, by no means the case in the removal and erection of the ordinary horse-mills. A certificate, given after two years' experience of their use, shows, that two men only were able to re-establish them in the course of an hour, in a fresh situation in the open air; and where they constantly and completely performed their work, without requiring any repairs.

The idea of communicating motion under the horse-walk, is not, however, new, as a horizontal axis, and toothed-bevel wheel-work produce this effect in the ordinary horse-mills. But independently of the complication of this wheel-work, and the impossibility of employing it without shelter, it also requires to be established with great solidity; and which, when we consider these as portable horse-mills, cannot be executed without a great expenditure both of time and materials, as each fresh establishment brings with it the necessity of fresh mounting the wheel-work with a rigorous exactness, in order that their teeth may act well in each other. It may likewise be remarked, that a horizontal axis can hardly transmit the motion to any great distance, whereas the chain may be indefinitely prolonged. The employing of a chain with common oval welded links, is also an advantage; as it may be procured any where, and it may be repaired at any time, by means of spare links, not welded, and which require no great exactness on their surfaces.

The new horse-mills, which we have thus described, are exceedingly portable, as the work of two men for an hour, is sufficient to establish one of them on a new foundation; but it is better, however, previously to construct in a pit, sunk into the earth, a frame-work, composed of pieces of wood, united at right angles to each other, and which may be effected at a trifling expense; and then, at the moment of removing the mill, there is nothing else to be done, than to carry away the great wheel and other parts; and which can be readily done upon a wheel-barrow!

The horse is attached to the outer end of the lever, by means of a swingle-tree and traces, which should be as short as possible. This is not indeed the best mode of doing it, as the point of attachment ought to be in the middle of the horse's back,

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and be effected by means of an iron arch. But the inventer prefers to fix the horse in the above mode; from the results of his experience; and he observes, that this method does not produce any ill effects, when horses are employed that have not been used to this work, but only in the conveyance of passengers.

In case of applying the horse-mill to actuate an Archimedean screw to raise water, and which screw is placed at an angle of about 45°, the movement is first transmitted horizontally from the great wheel by the chain, which, as abovementioned, passes through two cast-iron trunks placed under the horse-walk, and thence under two guide-pulleys, placed at a proper angle to lead the chain around a grooved wheel, with points to it, and which is affixed upon the upper end of the axis of the Archimedean screw. One of the guide-pulleys is mounted in a frame, affixed firmly to the basis or frame-work of the machine; but the frame of the other guide-pulley is jointed at its lower end to that frame-work, and has a horizontal arm or lever affixed to its upper part, upon which a weight can be slidden backwards or forwards, to adjust the tension of the chain at any time. The movable, or adjusting pulley, as well as the fixed one, is always to be placed at an oblique angle, which the tension of the chain naturally indicates.

A similar contrivance to the above will also answer, when conveying the movement to a horizontal axis. But when it is requisite to communicate motion to a vertical axis from the great wheel, then the tightening guide-pulley, which is the only one necessary to be used, must be mounted in a frame so as to swing horizontally; and which can be drawn sideways, so as to produce the necessary tension to the chain, by means of a cord affixed to it; and which cord, passing over a pulley, has a weight affixed to it.

The Editor of the *Bulletin Technologique* observes: An endless chain, formed of stout oval links, and actuated by means of a grooved wheel, armed with points, which enter into the links, and which wheel is driven by the steam-engine, &c., has been long and successfully employed in this country, (France) in drawing lead pipes, to carry forwards a carriage hooked to it, and which carries the triblet, and the cast leaden cylinder to be drawn into pipe; and we are glad to find that it has also been equally successfully used in other works, as appears from the above highly respectable certificate. We trust it will therefore now be more generally employed than heretofore.*

PATENT IMPROVEMENTS IN BEDSTEADS.

Mr. Breidenback, of Birmingham, claims under this patent the application of wire-gauze as a substitute for the sacking, head, tester and the various hangings of a bedstead; with the view of

* Gill's Tech. Repos.

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preventing certain pernicious vermin from establishing their domicile within its precincts, and the intrusion of divers insects and reptiles. Between the tropics of Cancer and Capricorn, the patentee's bedstead will, for these reasons, be a positive luxury. In lieu of the ordinary curtains, the wire-gauze will be framed into panels, and connected together by hinges, so as to allow any of them to be opened at pleasure: at the bed-posts the attachments may be either permanent or temporary; the sacking, head and tester, may, however, be permanently fixed; their removal, when required, will properly belong to the business of the mechanic.*

PRINTING AS RAPID AS WRITING.

We have examined a curious machine invented by Mr. Bart, of Macomb county, called by him a typographer. Its object is to enable a person to print with the same rapidity with which he can write, and to make one or more impressions at the same time, to the number of twelve. The letters of the alphabet are stereotyped together in a curvilinear groove, and affixed to a rod, one end of which moves upon a swivel, and the other is held in the hand. An index is immediately before the eye of the operator, where the letters are also arranged, and a notch corresponding with each letter is cut in a brass plate. The paper to be printed on is passed over a bar with a proper edge, covered by a cloth, and is moved by a roller; and the person operating has only to put the rod in the notch corresponding with the letter which he wishes to print, and the impression is made. The elevation of the rod from the notch moves the paper just far enough for another impression, and so on till the work is complete. The downright movement not only makes the impression, but keeps the types sufficiently provided with ink. The operation is as rapid as writing, and far less fatiguing. The machine is not less curious for its mechanical ingenuity than for its admirable simplicity. Bishop Wilson said, that the time would come when a man preparing for his journey would call for his wings as familiarly as for his boots. We have no doubt but the time is near when a man, to prepare his epistle, will instantly resort to his typographer, instead of his pen and ink.†

PRESERVATION OF ACCOUNT-BOOKS.

The following is from a correspondent of the "Ennis Chronicle." The plan seems well worthy of trial.

As the preservation of account-books from destruction by fire, must be, in an especial manner, an object of anxiety to merchants and all men of business, I would recommend that every

* Register of Arts. † American Paper.

office should have for the purpose, a recess in a good, strong, well-built wall, with a door to close air-tight; which door I would have constructed as follows:—I would advise to have the outer face of wrought or cast-iron, or brass, or whatever other cheap metallic material was found by experience longest or most powerfully to resist fusion or decomposition by fire; and to the back of this, at about half an inch, or an inch distance. I would have a lining of poplar wood, connected with the outer face of the door by a plate of iron or brass, different from the outer face itself, but screwed or riveted to both round the edges, so as not to come in contact with the fire. I would then have the space between the outer, or metallic face, and the inner noncombustible ligneous lining, filled with such earth or sand as was known to operate least as a conductor to caloric (or heat.) Thus, as I conceive, might a door, of an inch and a half, or two inches thick, be made fire-proof at a trifling expense.

STRENGTH OF OAK TIMBER.

On June 12, there were placed on the table of the Royal Institution some pieces of oak timber from the New Forest, which had been experimented upon as to strength, accompanied with drawings and notes of the results, laid upon the table by Mr. Hellyer. The following is an account of the experiment:—

In a violent storm in July, 1828, the lightning rent out a very long strip, of about two inches wide by one in thickness, from the heart of a fine oak, growing on an elevated spot in the forest. Nearly one quarter of the tree was forced away from the body of it, and several of the massy limbs of the upper part, were driven, as it were, from the sockets, a distance of several feet, and either lodged upon the lower limbs, or came at once to the ground.

The heart thus separated attracted particular notice. Its great toughness struck every one; and this circumstance, together with the general estimation for superior strength, in which the oak timber of this forest is held, led to the following experiment.

The object was to ascertain by actual experiment, made upon a large scale, what weight, laterally applied, the oak timber of the New Forest was capable of resisting.

For this purpose, by command of the first Commissioner of his Majesty's Woods and Forests, a seasoned stick of timber was selected from the timber in the wood yard of the crown. The tree was cut down in April, 1827; and it grew in a quarter of the forest called Stubby Copse. From about midway between the centre and circumference of the tree, and beginning at about four feet from the ground end, a piece of very good and perfectly sound timber was cut, and reduced to the dimensions of five inches square, and eleven feet long.

The place chosen for making the experiment was between two large trees, which were standing at a convenient distance from each other. Here a four-inch plank was partly sunk into the ground, to produce a level even surface. On the plank two uprights, made each of a portion

of the trunk of a lesser tree, were erected; and these uprights were braced and firmly supported, so as not only to bring their inner sides to the exact distance of seven feet apart at their superior extremities, at which the bearing lines were formed, but also to maintain them in that position, and at that distance invariably, during the application of the force.

The piece to be tried was laid across the two uprights; and a rough scale-like platform to contain the weight, formed of a very large plank, was suspended from the centre, by a strong timber chain. Upon this platform, piece after piece was laid of hard Purbeck stone, until it became evident that there was sufficient to effect the fracture, and in a few seconds the whole was borne to the ground The stones employed were then weighed off, at the scales in the bark shed, and the weight of the platform and chain being added, it was found that the aggregate weight by which the object had been obtained, was 9,061 pounds, or 4 tons, 3 quarters, and 17 pounds.

The experiment was made in the presence of the first Commissioner of the Woods, and the Secretary of the Board, of the Treasurer of the Ordnance, and of Mr. Hellyer, at whose suggestion it was undertaken; and the preparations for it were made by the Deputy Surveyor of the Forest and his assistants.

Two portions of the piece broken were on the table, showing the fracture.*

LARGE PAPER.

Much has been recently said about the immense sheets of printed paper produced by certain newspaper establishments; but it ought to be known that the difficulty does not consist in manufacturing paper of almost any size, but in having printing presses of the requisite magnitude. At White Hall Mill, in Derbyshire, a sheet of paper was lately manufactured which measured 13,800 feet in length, four feet in width, and would cover an acre and a half of ground.

EXPERIMENTS WITH LONG'S STEAM-PUMP.

Some experiments have been made at the West Point foundry, where a machine has been constructed of cast-iron. The boiler used is 50 inches in length, and 15 in diameter, giving a surface exposed to the fire of about 10 square feet, or sufficient for a one-horse engine of the usual kind. The cylinders or receivers are each of about three cubic feet, or 24 gallons, capacity. The pumps are 15 feet high and four inches in diameter. The escape tubes are 10 inches long, and of diameters the same as the pumps. The operation of the machine was to make five strokes per minute, or to fill and discharge one receiver three times, and the other twice, in a minute. Now, after making the greatest reductions for incomplete strokes that can be demanded, there will remain, for the actual performance of the machine, at least 80

* Brande's Journ.

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gallons of water, raised 15 feet. It is to be observed, that, as the steam is used in precisely the same manner, whether the receivers are 20 feet, or but one foot high, there will be the same quantity of steam used in the above machine, as though it were to work at its greatest height, or about 28 feet. The maximum effect, then, of the steam that would move a one-horse engine, when applied to work the above machine, will be to raise 80 gallons of water 28 feet per minute.

The work of a horse of the average strength is found, when reduced to the raising of water, equivalent to raise 70 gallons 25 feet per minute, one-fifth less than the above performance.

But let it be supposed, that the work of this machine is the same, or something less, than the power of the same steam, as commonly applied: it is obvious, that for many purposes it would be beneficial to use it as a mechanical power; for instance, where fuel is cheap, and the required power will not be sufficient for an expensive engine.

The principal object proposed by this invention is to afford a cheap method for raising water, where it is required to be raised in large quantities to heights less than 28 or 29 feet. It will be seen that the expense of all working machinery will be saved by this invention, as well as the force lost by keeping it in motion, two very material points in the use of machinery.

It is believed that this machine could be used to great advantage in dry docks, and for all other purposes where water is required to be raised in a similar manner. These are the objects of the invention; and should any farther explanations be thought necessary, they will be promptly furnished.*

MUSICAL SOUND.

On April 3, at the Royal Institution, Mr. Faraday delivered and illustrated the subject of the evening, which in fact was a continuation of Mr. Wheatstone's communications on the subject of Phonics, and consisted of further investigations of the resonances or reciprocated vibrations of volumes of air. By referring to page 26, *Arcana of Science* for 1829, a general account of the principle of resonances of volumes of air will be found. This was briefly recalled by a few simple experiments, and then the attention transferred to some particular effects produced by resonance of the air in the vocal and oral cavities. Thus,

When an original sound is produced, columns of air will reciprocate to it, not only when these vibrations take place with equal rapidity, but also when they are twice, thrice, &c. as rapid, or whenever these vibrations are any multiple of those of the originally sounding body; and it has lately been ascertained by Mr. Wheatstone, that very important qualities are sometimes given to sound in consequence of an effect de-

* Mech. Mag.

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pendant upon this principle. This was shown by the Æolina tongue, which in the first place was shown by experiment to owe nearly all its effects to the resonance of the volume of air confined in the mouth, and in the next, to have the quality and character of its sound very much altered by its vicinity to a column of air, the length of which could be changed at pleasure, so as to cause different multiple reciprocations to the standard sound of the Æolina. Many sounds, which have been supposed to be simple, appear to consist of two or more distinct sounds, all after the first and predominating sound being due to additional sounds produced in this way.

During the evening a very singular illustration was given by Mr. Mannin, of the power of producing two simultaneous sounds from the mouth. It was strikingly shown in some airs which he whistled first as solos, and then as duets. From the command posessed over this power by Mr. Mannin, so as to produce the simultaneous sounds either quickly or slowly at pleasure, no possible doubt could be entertained of the fact. It appeared that at the time time, the mouth is divided into two parts by the tongue, and that each portion of air is thrown into a separate state of vibration by the embouchure formed at the lips.

On May 22, Mr. Faraday, for Mr. Wheatstone, lectured "on the Nodal Figures of Vibrating Surfaces."

The main object of the evening was to describe and illustrate those lines of rest existing in vibrating surfaces, which have been called nodal lines, and which, discovered by Chladni are rendered evident by the accumulation of small heavy particles, sprinkled over the surfaces before, or whilst in a vibratory state. A nodal point was illustrated by reference to the original experiment and discovery made by Messrs. Noble and Pigott, in the year 1673, when under the tuition of Dr. Wallis, and in which it was shown that a stretched string could be made to vibrate not only as a whole, but in aliquot parts, the portions being separated by points of rest. A long piece of cane shaken in the air showed, on a large scale, one, two, or three points of rest, according to the mode of vibrating it, and other experiments for the purpose of making this simple and elementary idea of a node were exhibited.

With regard to surfaces, it was stated that Galileo has first put upon record the knowledge that an elastic surface giving sound has some parts in motion, others at rest; and he directs that, for the purpose of making these parts visibly distinct, pieces of bristle should be strewed over them: he practised this upon the sounding-board of an instrument.

But it was Chladni who, in 1785, observed the beautiful forms into which particles of sand, or metal filings, were arranged by the vibratory motion of an elastic plate. Let a square plate of crown glass, about three inches on the side, be held horizontally by the finger and thumb applied to the opposite central points of the surfaces, and then let a violin bow be drawn perpendicularly over the edge, so as to produce a regular musical sound; if, at the same time, a little coarse dry sand be sprinkled upon the glass, it will immediately assume a regular form, probably a cross consisting of two lines, either parallel to the sides, or to the diagonal, according as the bow has been applied near to the corner, or near the middle of a side. By holding the plate in different places, and in different manners, and varying also the application of the bow, so as to produce different sounds, the forms will be seen to differ,

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and sometimes as many as twenty or thirty be obtained. These forms indicate the parts where the plates are at rest; the other parts are, of course, in such a vibratory state as to produce sound. They have been carefully traced and recorded by Chladni; and diagrams of complete series of them were placed up in the lecture-room. The general rules for producing the forms, whether upon square, round, triangular, or other plates were also given, so as to place the phenomena quite at command.

Other modes of exciting the plates due to Le Blanc and Savart, and competent to produce new figures, were also described and illustrated.

An account was then given of the production of figures, not upon surfaces directly thrown into a vibratory state, but such as were made to vibrate by reciprocation. These are due to Savart, and by making use of thin extended membranes, he has shewn various new facts in addition to those of Chladni, and especially the possible transformation of figures.*

RUSSIAN COINAGE OF PLATINA.

A LETTER from Professor Breithaupt to Dr. Schweigger, an extract of which is given in a late number of the *Jarhbuch der Chemie, &c.* confirms the statement some time since made by the newspapers, that the Russian government had resolved to coin a large sum in Siberian platina. It appears that Count Denidoff, the proprietor of the locality where the platina was discovered, has disposed of to the government the quantity of that metal which had been collected. He has sent four young Russians, destined for official situations in Siberia, to be educated in the mining academy of Freyberg.†

APPARATUS FOR THE SOUNDING OF CHURCH BELLS.

Invented in Denmark.

IT is well known that buildings suffer much from the sounding of bells, especially when they are very heavy. Let one, in fact, only imagine a mass of several tons swinging to and fro, and he will readily perceive how much a building must be shaken by it. It has long been tried to invent proper means of sounding bells without pulling. These means have hitherto consisted in striking the bell with a hammer or clapper, put in motion by a machine, which may be made to go fast or slow. The intervals, however, are rarely equal, and the clapper or hammer, after, each blow, remains some time in contact with the bells, rendering the sound less distinct. Some of these inconveniences have been removed by a machine invented by a Danish smith, Soendsen. This machine, however, had the defect of being too complex, and of not being founded on the law of free oscillations. On the occasion of suspending a new bell in the belfry of the church of Nôtre Dame, at Copenhagen, Professor Oersted endeavoured to improve

* Brande's Journ. † Ann. of Phil.

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Soendsen's machine. For this purpose, he introduced into it a balance, similar to that of a pendulum. An axis, by turning, raises a hammer, which, at each turn, strikes the bell, and produces a sound which cannot be distinguished from that emitted by the bell when tolled. This mechanism has the additional advantage of requiring only a single person, whereas to toll bells, it sometimes requires so many as ten. The motion of the axis may be accelerated or retarded. Perhaps, also, by means of the new apparatus, the same sound may be obtained from a much smaller mass of metal. Professor Oersted hopes that the ideas here emitted will excite other persons to improve the sounding of bells. We recommend this subject to the attention of the magistrates of our different towns.*

SPEAKING PIPE.

The main-mast of the *Briton* has been fitted with a tin pipe, for the conveyance of the voice in boisterous weather from the quarter-deck to the main-top. The pipe is about one inch in diameter. It is a proposition of Mr. Parsons, of Portsmouth dock-yard.†

SELF-LOADING CART.

The *Richmond Compiler* contains a notice of a singular cart, invented by a Mr. W. Beach, of Philadelphia. It is described as loading itself by means of one of the wheels, which is hollow, scooping up the earth as it revolves round. A cart of this construction is stated to be at work on the rail-road, within a mile and a half of the Schuylkill river, near Philadelphia. It is worked by a man and a boy; and removes and embanks in a day twice as much earth as is accomplished by three common carts and twenty men.

OPENING OF SHUTT END RAILWAY.

The opening of the new rail-road from Kingswinford to the Staffordshire and Worcestershire Canal with a locomotive steam-engine, took place on Tuesday, June 2, upon which occasion the following experiments were made:

The entire length of the railway is three miles and one-eighth; it commences at the colliery of the Earl of Dudley, by an inclined plane of one thousand yards in length, having an inclination of 2 feet 3-10ths in a chain, and the carriages with coal are delivered down the plane in three minutes and a half, bringing up at the same time an equal number of empty carriages. The railroad then proceeds from the foot of the inclined plane for 1 mile and 7-8ths, at an inclination of 16 feet in a mile; and on this

* Foreign Journ.

† Hampshire Telegraph.

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part of the railway the locomotive engine travels and delivers the wagons at the head of another inclined plane of 500 yards in length, having an inclination of 2 feet 35-100ths in a chain. The wagons are passed down this plane in a similar manner to the first, in one minute and three quarters. At the foot of this second inclined plane there is a basin 750 yards long, communicating with the Staffordshire and Worcestershire Canal, parallel to which the rail-road is continued on both sides, affording the means of loading sixty boats at the same time; and over the middle of this basin is a handsome bridge of eleven arches, on which the road from Wordsley to New Inn passes.

The experiments on Tuesday commenced by the passing of a train of four carriages, each loaded with three and a half tons of coal, down the first inclined plane, an operation which highly gratified the spectators, from its extreme simplicity. The locomotive engine, named the "Agenoria," was then attached to eight carriages, carrying 360 passengers, the weight being—

	T.	C.	Q.
The eight carrriages - - - - -	8	8	0
Locomotive engine, tender, and water -	11	0	0
360 passengers, estimated at - - -	22	10	0
	41	18	0

and the whole proceeded, attended by a band of music, from the foot of the first inclined plane to the head of the second, and returned,—being a distance of 3¾ miles,—in half an hour, or at the rate of 7½ miles per hour. The distance might have been accomplished in much less time, but, being the first experiment, all the power of the engine was not applied. On the return of the engine and passengers, carriages laden with coal, to the number of 12, had descended the inclined plane; these were attached to the engine with eight carriages of passengers, the weight being—

	T.	C.	Q.
20 carriages - - - - - - - -	21	0	0
Engine, tender, and water - - -	11	0	0
Coal in 12 waggons, 3½ tons each - -	42	0	0
360 passengers in the eight carriages,			
540 ditto on the coal carriages, and			
20 ditto on the engine tender			
920, estimated at - - - - - - -	57	10	0
	131	10	0

The engine then started with its load of 131 tons, and proceeded to the head of the second inclined plane; and the distance, 1 7-8ths mile, was performed in 38 minutes, being at the

rate of nearly 3½ miles per hour. On arriving at the head of the inclined plane, the carriages loaded with coals descended the plane. The engine next returned with the 8 carriages loaded with passengers, at the rate of 6 miles per hour; and on reaching the foot of the first inclined plane, all the carriages were disengaged from the engine, except the tender carriage with 20 persons on it. The engine was again started, and proceeded with the tender and 20 passengers about a mile on the road, performing the trip at the rate of 11 miles per hour, although not more than half of the engine power was laid on. This concluded the experiments; and not the slightest accident occurred, although an immense crowd was collected about the carriages whilst proceeding,—many of whom, by hanging to them, very much impeded the progress of the engine in the second trip with the 20 carriages; indeed, it was computed that in addition to the 920 passengers in the carriages, 300 others were dragged along.

The engine was made under the superintendence of Mr. J. U. Rastrick, at Stourbridge, who has bestowed no ordinary pains in its construction, so as to obviate the noise and smoke which those of original make, and used in the North of England, are subject to. The noise occasioned by the escape of the steam, when discharged from the cylinder, is wholly done away with; and the smoke is scarcely more than that produced by an ordinary chimney. The safety valve is much improved by a spring, so as to prevent the escape of steam from vibration of the engine; and another safety valve is addded, which is entirely inaccessible to the engine-man,—thus rendering the engine infallibly secure from explosion. Another very ingenious contrivance is introduced, by which the engine oils its bearings on the carriage at every revolution of the wheels.*

THE AMICIAN CATADIOPTRIC MICROSCOPE.

(See the Engraving.)

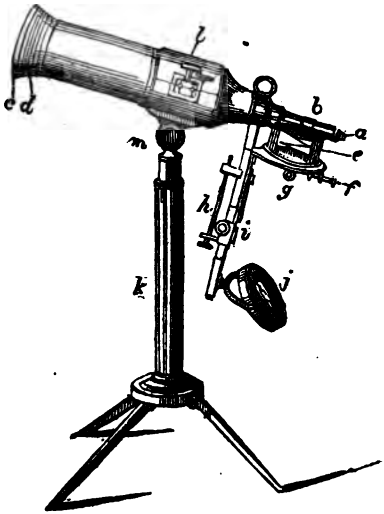
The followiug account of the latest modifications in the structure of the Amician Catadioptric Microscope, with full and particular directions for managing and observing with it, is from the ingenious pen of Mr. J. Cuthbert:

Dr. Goring, in his account of the improvements which have been made in England on the Reflecting Microscope of Professor Amici, has given directions for using this instrument, but such as I find by experience to be inadequate to enable observers, not greatly habituated to the use of microscopes, to manage it in an effective manner. The following description and instructions are intended, with the help of the wood engraving, to supply the place of a *vivâ voce* lecture upon the instrument itself, and are adapted to the standard of the meanest capacity.

* Birmingham Gaz.

When the instrument is removed from the box, nothing more is required than to reverse the legs, and draw back the slide on the small tube containing the reflectors.

The cut shows the instrument ready for use.



(*a*) The tube containing the reflectors.

(*b*) The slide which covers the aperture, to preserve the reflectors when not in use. The tube can be unscrewed to substitute the other reflectors, which differ in magnifying power.

(*c*) The eye-tube, which can be drawn out to apply others, which also vary the power.

(*d*) Shows the milling of an internal tube, which may be partly drawn out, thereby lengthening the body, and thus giving a further increase of power, or intermediate powers between those produced by the eye-tubes.

(*e*) The slider holder for supporting the objects: it may be detached from the stage at pleasure.

(*f g*) Two adjusting screws, by which the slider holder can be moved in cross directions for the purpose of bringing any part of the object to the centre of the field of view.

(*h*) The screw by which the object is adjusted to the focus.

(*i*) The milled head which clamps the screw apparatus to the bar of the instrument, after roughly adjusting the focus, by moving it up and down on the bar: the correct adjustment is affected by the screw *h*.

(*j*) The illuminator, which has a concave and a plane surface to be used at discretion.

(*k*) The pillar, composed of two tubes; the internal one can be drawn out to raise the instrument, either for the convenience of the observer, or to regulate the light from the lamp, which should also have a similar adjustment.

(*l*) The screw for tightening the cleft-socket, by which means the body of the instrument with its apparatus can be kept in any required position, the variety of motions given by means of the cleft socket *l*, the joint *m*, and the sliding pillar *k*, leaves nothing further to be desired, either in point of utility or convenience.

The most convenient method of proceeding to examine objects is as follows:—After setting up the instrument, and drawing back the slide on the tube of reflectors, turn the illuminator

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towards the light, and at such an angle, that the rays may be thrown up to the small aperture of the tube, containing the reflectors, when the field of view is perfectly illuminated, an even, round, and bright disk of light will be seen in the body of the instrument, or the illuminator may be removed, and the body of the instrument turned round, to procure the simple and unreflected light, which, in most cases, will be found the best method of procedure. The slider containing the object to be examined may then be introduced between the bars and spring plate of the slider-holders, remembering to place that side of the slide on which the brass ring is not seen, next to the tube of reflectors. The object may then be adjusted to the focus in the following manner:—

First slack the screw (*i*,) then slide the whole of the screw apparatus up or down, till the object is nearly in the focus; then tighten the screw (*i*) and perfect the adjustment, by turning the milled head of the screw (*h*.) It is proper to remark, that, as the brightness and ease of vision must necessarily decrease with the increase of magnifying power, it should be so arranged as to suit the particular kind of object under examination, using no more amplification than is absolutely necessary. A low power is best suited to make out the general character of an object in the first instance; it may then be increased for investigating its more minute parts.

The low powers may be used for opaque objects, without the condensing lens, *if the daylight is bright*, or by merely bringing the lamp towards the side of the tube, containing the reflectors. When the higher powers are used, the small condensing lens must be made use of, placing the light the same distance from the lens as the lens is from the object, viz., about an inch and a half.

The most powerfnl mode of illuminating for high powers is obtained by the use of the condensing cups and large lens. This method shows objects in a brilliant light, with scarcely any shadow, and answers well for the generality of opaque objects.

Some require oblique lights to produce a shadow, such as the fine lines on the scales of the diamond beetle, which can scarcely be seen by a direct light, and, in such cases, the small condensing lens must be used. The focus of the reflectors may be made to coincide exactly with that of the condensing cups by a small elongation of the tube, (*d*.) Care should be taken that the tubes containing the reflectors are screwed perfectly home, so that the aperture may be truly opposite the slider-holder, and in the line of the bar; a rase is cut round the tube of reflectors, as a rough guide for bringing the object under the aperture. The shortest tube of reflectors is the most powerful of the set: the focus of its concave reflector is 3-10ths of an inch, its diameter 2-10ths full, and the object requires to be placed about 1-20th of an inch from the side of the tube.

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The second pair of reflectors is 1-6th of an inch focus, and aperture 3-10ths; its focal point about 1-10th of an inch from the side of the tube.

The third pair of reflectors is one inch focus, and full 3-10ths of an inch aperture; the focal point about 1-5th of an inch from the side of the tube. The longest tube of reflectors is 2 inches focus, and ½ an inch aperture; the focal point is half an inch from the side of the tube: from its small power, it is that best adapted for the larger objects. The instrument is furnished with three eye-tubes, and, like the tubes of reflectors, the shortest magnifies the most. Either of the eye-tubes can be used with the different tubes of reflectors, *observing that it is always best to gain the power by the reflectors.* Use, therefore, short reflectors and long eye-tubes.

When the greater powers are wanted, of course the short eye-tubes are to be used. By lengthening the body of the instrument, a great increase of power may be obtained.

In some instances an inconvenience occurs from this mode of gaining power, *as the focus is brought nearer to the side of the tube;* of course the light is not then so easily applied to opaque objects.

The powers given by the combinations are nearly as follows:— The long tube of reflectors, with the combinations of the three eye-tubes, magnifies from 5.00 to 5.000 times *in superficies;* the next in length, from 3.000 to 50.000; the next tube from 8.000 to 160.000; the short tube up to 320.000; the elongation of the tube produced a further increase up to 1,000,000 times. The most generally useful reflector will be found to be the shortest but one. The shortest one is only requisite to define the most difficult class of *lined objects.*

Particular care should be taken to keep the tubes of reflectors closed when not in use: the metals will not require any cleaning, and should not be removed from their tubes. The glasses of the eye-tubes require to be most attended to, as dust or finger-stains upon them very much lessen the brightness and distinctness of vision. When the eye-tubes are cleaned, only one glass should be removed at a time, and wiped with a soft piece of leather, and then replaced before another is taken out, to prevent the misplacing of them, as such a simple mistake would render the instrument nearly useless.

The talc between which the objects are placed being of a soft nature, care should be taken, not to scratch or soil it with the fingers. Dust is best removed by a camel hair pencil, and stains by a soft piece of leather. It often occurs in cold weather, that, when the instrument is used, it is considerably below the temperature of the room or observer, and, consequently, a condensation of vapour takes place on the glasses of the eye-tubes, which prevents distinct vision, and though wiped off, will still continue to condense from the eye of the observer. Till the instrument

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has acquired sufficient warmth to prevent such impediments, it is requisite to place it for a short time before the fire.

The most delicate test objects are the lines on the feathers of butterflies or moths' wings, of which there are many gradations; some easily demonstrated, and others more difficult to be seen, and then only with the most powerful reflectors, and seen to the best advantage by the simple and uncondensed light of the lamp. The light must be so arranged that the rays will pass through them in an oblique direction; also the position of the object must be attended to, for in some positions not a line will be seen, when a little variation of the light may render them perfectly distinct. The hair of a mouse is a very good test object: it is best seen by daylight; the most difficult parts of which are longitudinal lines in the transparent part of the hair, which require high powers. The hair of the bat and seal are also fine tests. The lines on the scales of the diamond beetle, &c., are excellent opaque proof objects. The feet of flies are likewise very interesting.

It does not become me as a maker of these instruments to say more of them than that they have been compared with the best microscopes now extant, and have given the greatest satisfaction; and that it is the opinion of most observers that the vision from truly-executed specula produces a degree of delicate distinctness which no refracting microscope can rival.*

PRICE OF CALICO FIFTY-THREE YEARS AGO.

THE following memorandum was written in a Bible, now in the possession of a family at Rishton, near Blackburn, for the purpose, no doubt, of recording the period when the manufacture of calico was first introduced into this country.—"15 September, 1776. Thomas Dixbury, of Rishton, near Blackburn, sold to Messrs. Peels, Yates, and Co., Church Bank, two common-fine calico pieces for 5*l*. 9*s*. 8*d*. These were the first calico pieces ever manufactured in this kingdom." Pieces of the same description are now sold for about 5*s*. 6*d*. or 6*s*. each.†

GIG DRAWN BY A WOODEN HORSE.

A NEWLY invented gig, drawn by a wooden horse at the rate of a mile in six minutes, and carrying three passengers, has been exhibited at Keighley. The mechanism from which this extraordinary vehicle receives its impulse is the invention of Mr. Isaac Brown, of East Morton, near Bingley. The horse, though of such untractable materials, may be guided in any direction by a single rein attached to the mouth.‡

* Brande's Journ. † Mechanics' Mag.
‡ Leeds Mercury.

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MUSICAL AUTOMATA.

A MECHANICIAN, brother to the celebrated Maelzel, of Vienna, has constructed at Boston a set of musical automata, no less than forty-two in number, which compose a complete orchestra, and execute several of the most difficult pieces of music in the most perfect manner,—among others, the Overtures to Don Juan, Giovanni, Iphigenia, and La Vestale. Those which excite the most admiration and wonder are the violin-players, which execute their portion of the music precisely as if they were living performers, viz. by the motion of the fingers, &c. A company of Americans have offered the artist 300,000 dollars for this extraordinary and unrivalled piece of mechanism; but the price demanded is 500,000 dollars, and it seems probable that it will be obtained.*

NEW, SIMPLE, CHEAP, AND PORTABLE BELLOWS, FOR MINIATURE GLASS-BLOWING.

THE enameller's table, which is always expensive, is likewise bulky, and occupies a considerable space. This apparatus invented by M. Danger is, on the contrary, of an exceedingly moderate price, and can be packed up in a very little compass.

It consists of a bladder, which is affixed by a tube of glass to a piece of wood, serving as a foot to it, and by which it can be secured upon a table; this block of wood also supports a curved tube, which directs the air properly upon the flame of the lamp. Another bent tube serves to convey the wind from the mouth of the workman into the bladder. The apparatus being affixed to the table, the artist places the filled bladder between his knees, producing thereby any convenient degree of pressure upon it; in order to replace the air which is thus expelled it is sufficient to blow in a small quantity from time to time as required.

To hinder the air from escaping by the mouth tube, M. Danger has placed a small valve upon its inner end, which is made with a small bit of cork, affixed to a copper wire.

We can easily conceive, that by means of this exceedingly simple apparatus, glass may be worked into every required shape; and M. Danger, who is a very expert workman, is enabled to effect every thing by its use, which can be done by the bellows and the glass worker's lamp.

It is obvious that the bladder, when emptied of air will occupy but very little room, and that the apparatus thus becomes exceedingly portable.†

WOOLLEN MANUFACTURE.

A FRENCH paper (*Le Constitutionnel*) states, that the manufacturers of Elbeuf and Louviers have discovered and adopted a

* Literary Gaz.

† French Journ.

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mode of preparing woollen cloths without oil, or any description of grease—thus rendering the manufacture more cleanly, wholesome and economical. The *Constitutionnel* adds, that the cloth prepared according to the new process is as soft, and in every respect as good as that made upon the old system.*

COAST LIGHTS ON A NEW PRINCIPLE.

In a paper published in *The United Service Journal*, Mr. Martin, the celebrated painter, details the particulars of a method invented by him, of guiding vessels by night as well as by day, through the shoals which beset the English coast, by means of suspended light towers. Mr. Martin recommends, that after ascertaining by boring the depth of the sand, a broad triangular foundation shall be laid in the following manner, as described by himself:—The material of the foundation to be hollow metal boxes, each furnished at one end with two projecting portions (and at the other with two corresponding holes, so that each box may be firmly locked into that on either side of it; the boxes are hollow, that they may be more easily managed by the workmen, and are less expensive, but they will be sufficiently heavy, because each box, as it sinks, will be immediately filled with sand. One hollow triangular layer of these boxes, thus inseparably locked in each other, must, in the interval of one low tide, be deposited upon the sand. This layer will have sunk to a certain depth at the ebbing of the next tide, when another triangular layer of these boxes must be dropped upon the first. This additional weight would cause the first layer to sink still deeper. And over these, at a very low tide, fresh layers of boxes must be sunk, until the lowest has reached the firm sand, or other substance, and will sink no further. Into every hollow box, as it descended, the sand would enter: it would also completely fill the hollow triangular foundation, and being protected by it from any external influence, would add to its stability. When so many layers of boxes have been sunken that the upper layer lies within three or four feet of the surface of the sand, and will not sink further, the foundation would be completed. A light-tower, circular in form, as that least likely to be affected by the influence of the winds and waves, about ten feet in diameter, might then be suspended from the junction of three wrought-iron legs, inserted into the foundation, and strongly united at their apex, thus assuming the form of a pyramid, with an equilateral triangular base. Upon rocks lying beneath the water, the hanging tower could be adopted with still greater advantage. In such a situation the triangular frame, or foundation, would not be necessary, as the legs of the triangular could be fixed firmly into the rock.

* Lit. Gaz.

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STEAM CARRIAGES, AND THEIR ESTIMATED INFLUENCE ON DOMESTIC AND GENERAL IMPROVEMENT.

The progress that has been made, within the last few years, in the adaptation of steam to road-carriages, has been most extraordinary; and the prospects which it holds out of human improvement are almost beyond the power of the imagination to contemplate. It is not clear to what extent steam may be applied to carriages on common roads, unless by stationary engines, or where the roads are level; but it has been proved by the experiments lately made at Liverpool, that carriages can be impelled along a railroad at the rate of upwards of thirty miles an hour. It cannot be too much, then, to conclude that, on the average of the main roads of Britain, if a railroad were laid down on one side of the common road, the travelling between all the grand points, as London, Edinburgh, Glasgow, Aberdeen, Inverness, Fort George, Greenock, Liverpool, Bristol, &c. &c. might be performed at the rate of twenty-four miles an hour. The cheapness of this mode of travelling is not less remarkable than its rapidity. The editor of the *Scotsman*, in a most interesting article on the subject (Oct. 21), calculates the coach-hire per head at 1*s*. for fifteen miles, and the hire for goods at about 2*d*. per ton per mile. In a work like ours, professing to record the progress of rural and domestic improvement, it cannot be considered irrelative to give the following extracts:—

"When the carriage of goods which is now about 9*d*. or 10*d*. a ton per mile by land, is reduced to 2*d*., and when, in point of speed, one day does the work of four, the heaviest commodities, such as corn, potatoes, coals, will bear the expense of carriage for a hundred miles. The result of this will be, that the expense of living in great towns will be reduced, and the price of raw produce will rise in remote parts of the country. The facility, celerity, and cheapness of internal intercourse contribute more, probably, to the advancement of civilization than all other circumstances put together. Sixty or seventy years ago the journey from Edinburgh to London occupied twenty days; at present, taking the average of all the modes of conveyance by land and water, it occupies three or four, and the quantity of travelling has increased probably twenty or thirty fold. Are we too sanguine in anticipating another increase equally great, when the time is reduced from three or four days to twenty hours, the expense almost in the same proportion, and when the traveller is put in possession of a much higher degree of ease and comfort? Let the improvement we speak of be realized, let what was once a journey of twenty days be reduced to one of as many hours, and we have not a doubt that we shall have five hundred times as much travelling as we had in the year 1760. In point of fact, when the time is reduced from eighty hours to twenty, the result is exactly the same as if Edinburgh were brought as near to

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London as Leicester or Birmingham; and, to pursue the comparison, when the journey was one of twenty days, the effect was the same as if Edinburgh had stood in Iceland. Besides, we must always remember that the intercourse grows in a much greater ratio than the distance is shortened. Volumes might be written without exhausting the materials for speculation arising out of such a change. To use our own words, when writing upon this subject in 1824: 'With so great a facility and celerity of communication, the provincial towns of an empire would become so many suburbs of the metropolis—or rather the effect would be similar to that of collecting the whole inhabitants into one city. Commodities, inventions, discoveries, opinions, would circulate with a rapidity hitherto unknown; and, above all, the intercourse of man with man, province with province, and nation with nation, would be prodigiously increased.'

"We now look back with some pride to the series of papers which we published in the *Scotsman* on this subject four years ago, which first developed the advantages derivable from employing locomotive carriages on railways, for the purposes of commercial intercourse of all kinds. *Practical men*, as they term themselves, were shocked.* The trial has been made, however, and the result has confirmed, and even exceeded, our most sanguine anticipations.

"A notable project is suggested in the *Journal des Debats*, in a letter from a Frankfort correspondent. This is nothing less than the formation of a canal to unite the Danube and the Rhine, and thus to secure the means of an uninterrupted navigation from the Tower of London to the Golden Horn at Constantinople, or the most distant part of the Euxine and Levant. Thus, Europe might be traversed from its western to its eastern extremity by steam-boats; and travellers, without changing their conveyance, might start from the Thames to visit the ruins of Troy, or the pyramids of Egypt."

This project was talked of at Munich when we were there, about this time twelvemonth; and the engineer, Bader, was of opinion, that a suspension railway was greatly to be preferred,

"* Mr. Nicholas Wood, one of the judges at Liverpool, published an octavo volume, in 1825, containing the result of his own experiments at Killingsworth, and inserted the following remarks, in allusion to the articles in the *Scotsman*:—'It is far from my wish to promulgate to the world that the *ridiculous* expectations, or rather the *professions* of the enthusiastic speculatists will be realized, and that we shall see engines travelling at the rate of twelve, sixteen, eighteen, or twenty miles an hour. Nothing could do more harm towards their adoption or general improvement than the promulgation of such *nonsense!*' Mr. Wood, as the editor of the *Mechanics' Magazine* observes, has been spared to see, not only what he declared to be 'ridiculous' and 'nonsense' reduced to an unquestionable matter of fact, but of witnessing something so much more extraordinary, that had any one hinted it to him in his days of incredulity, he would, we presume, have pronounced it to be absolute madness."

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in that and in every country liable to much frost and snow. We have no doubt that the time will come when a railway will be laid down between Paris and Pekin, and steam-carriages employed on it. The tract of country by Berlin, Vienna, Moscow, and Astrachan, we understand, is almost level; and if the governments of Europe were to become shareholders in such a railway, there can be little doubt it would pay. In contemplating the introduction of railways and steam carriages in Russia, North America, and Australia, it seems to reduce these immense countries to the size of Britain; and viewing their extension to Asia and Africa, the travelling capacity of the whole world is brought within that of Europe. The editor of the *Scotsman* truly says that whole volumes might be written on the changes which this improvement is calculated to effect—that the French revolution sinks into nothing in comparison with it, and that the only single impulse to civilization that has ever surpassed it is the art of printing.

"The experiments at Liverpool have established principles which will give a greater impulse to civilization than it has ever received from any single cause, since the press first opened the gates of knowledge to the human species at large. Even steam navigation gives but a faint idea of the wondrous powers which this new agent has put into our hands. It is no exaggeration to say, that the introduction of steam carriages on railways places us on the verge of a new era—of a social revolution of which imagination cannot picture the ultimate effects."*

PATENT SHIP'S PUMP.

By George Clymer, of Finsbury.

THE prospectus states that the properties of this machine are to consist—

First—As a ship's pump, raising more water by an equal power than any other now in use.

Secondly—It is not liable to be impeded or obstructed by such substances as impede, obstruct, or choke all other ship's pumps. It will not only raise and discharge all kinds of grain, corn, sand, gravel, ballast, stones, &c., but, although the present pump is made on a very moderate scale, it will raise four hundred gallons of water per minute, and disgorge 18 and 24 lb. shots in rapid succession, or any other substances which come within the draught of its powers, and does not exceed the diameter of a 24lb. shot, together with the water: and they may be made on a more extended scale, so as to raise double the quantity of water, or even more, and substances of a proportionate size.

Thirdly—From its peculiar construction, simplicity, and

* Gardeners' Magazine.

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strength, it is not liable, but almost impossible to be injured by the roughest usage.

Fourthly—Those parts which are most exposed to injury by use, can be easily and quickly repaired, because they are all in sight, and within hand-reach.

Fifthly—In a few seconds it is convertible into a most powerful extinguishing engine, and may be used as such on all occasions where an engine is requisite on board ship. When thus used, the water is, of course, drawn from alongside, and may be driven in torrents through and over every part of the ship, even over the mast-head.

Sixthly—It is likewise as quickly converted into a syphon, by which immense torrents may be made to descend from alongside into the hold; and if conveyed by branches or tubes, fore and aft, and discharged at each extremity, will drive the bilge-water before it into the mid-ships, where it is quickly pumped up—thus keeping a continual supply of pure water in the hold, instead of a stagnant bilge-water, from which arises those noxious, pestilential, and corrosive exhalations, which not only injure the cargoes and inconvenience the passengers and crews, but destroy the very materials of which ships are composed.*

IMPROVED PADDLE-WHEELS.

Among the great variety of improved plans for propelling vessels which have recently become the subjects of patents, a contrivance proposed by Mr. Perkins, the engineer, and recorded in Mr. Newton's *Journal of Arts*, is remarkable for its simplicity. The disadvantages attendant upon the ordinary propelling wheels, from the circumstance of the broad face of their paddles pressing on the surface of the water, in entering and lifting the water, in rising out of it, are obviated by passing the paddles into the water sideways, giving the propelling stroke direct, and passing out of the water sideways also. The invention consists, first, in the peculiar position in which the paddle surfaces of the propelling wheels are placed—viz. in radial directions round the periphery of the wheel, and parallel to each other, but crossing the radial planes of the axis in angles of about forty-five degrees; secondly, in placing the shaft or axle of the paddle-wheel at an angle of about forty-five degrees from the direction of the keel, or the side of the vessel. The object of so arranging the angles of the paddles, and the paddle-wheel shaft, as respects their rotative positions to each other, and to the keel of the vessel to which they are to be applied, is for the purpose of introducing the paddle into the water edgewise, and after giving a direct propelling stroke with the surface of the paddle at right angles to the keel, to pass it out of the water in a similar way. By placing the paddles in the oblique positions described, it will be

* Register of Arts.

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perceived that the two paddles which stand at opposite points of the periphery of the wheel will have their faces situated at right angles to each other, the upper paddle always being in a line with the keel—that is, edgewise; and the lower operating paddle being at right angles to the keel, and a direct stroke of the paddle in the water in the line of the keel, will be the result of this arrangement. It certainly cannot be said that the paddles of this wheel will give as long a stroke through the water as some other constructions of wheels in which the paddles turn upon their axles; but the circumstance of the paddles being firmly fixed, and the parts of the wheel being subject to no other movement than that upon its common axle, are advantages which, at sea, would perhaps recommend the plan of Mr. Perkins before all others.*

LIVERPOOL AND MANCHESTER RAILWAY.

Mr. Walker and Mr. Rastrick were employed in January last, jointly, by the Railway Company, to report upon the *comparative merits of locomotive and fixed engines as a moving power*, for which purpose they visited all the principal railways in the north of England, made the most minute and careful inquiries as to the vehicles and species of moving power employed on them, and then gave the result of their investigation in separate reports. Mr. Rastrick's report agrees in every essential circumstance with that of Mr. Walker, which gives the following general results:—

Capital necessary on the locomotive system	£ 91,000	0	0
Ditto on the stationary system - - - -	101,000	0	0
Difference in favour of the locomotive -	£ 10,000	0	0
Annual expense and interest of capital on locomotive system - - - - -	43,000	0	0
Ditto. ditto, on stationary system - -	33,000	0	0
Difference in favour of stationary system -	£ 10,000	0	0
Locomotive system—rate per mile - -	·2787 of a penny		
Stationary system—do. - - - - -	·2134 do.		
Difference 1-16th of a penny, or - -	·0653 do.		

Or the rate by the two systems is as seven to nine in favour of the stationary engines.

Mr. Walker, however, candidly observes, that improvements are now making in the construction of locomotive engines, which may reduce the expense of employing them so as to alter the above results materially. In the stationary system, accidents, he

* Monthly Mag.

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thinks, will be less frequent; but when they occur, they will extend to the whole line. In the locomotive system they will be confined to the single engine which goes wrong, and its train. In the stationary system, there must be a perfect sympathy and uniformity from end to end. In the locomotive system, one engine, with its train, by passing to the sidings, may stop any length of time it finds necessary, without preventing the others from pursuing their course. Messrs. Walker and Rastrick give the following joint opinion as to the two modes:—"Upon the consideration of the question in every point of view, taking the two lines of road as now forming, and having reference to economy, dispatch, safety, and convenience, our opinion is, that if it be resolved to make the Liverpool and Manchester Railway complete at once, so as to accommodate the traffic stated in your instructions, or a quantity approaching to it, the stationary reciprocating system is the best; but that if any circumstances should induce you to proceed by degrees, and to proportion the power of conveyance to the demand, then we recommend locomotive engines upon the line generally, and two fixed engines upon Rainhill and Sutton Planes, to draw up the locomotive engines, as well as the goods and carriages."*

ACCOUNT OF THE PRINCIPAL RAILWAYS IN THE KINGDOM.

(Chiefly extracted from Tredgold's work on the subject.) †

The Hetton railway is one of the principal ones: it is in length seven miles five-eighths; and on a train of from thirteen to seventeen wagons is impelled by a locomotive high pressure engine. The train of seventeen wagons, when loaded with their usual weight of coals, is about 64 tons. The total variation of level from the pit to the staiths is 812 feet, of which, a part is accomplished by inclined planes, and the rest by regular descent of 1 in 335. The rails are of the edge kind—the extreme length of each is 3 feet 11 inches, and the breadth of the upper surface 2¼ inches: they join with a scarf joint. The carriages are propelled by the locomotive engine, at the velocity of from three and a half to four miles per hour. Similar railways are established in the neighbourhood of Whitehaven, in Cumberland. From these the use of railways has gradually spread to various places—Yorkshire, Derbyshire, Wales, and Scotland.

The Surrey rail-road commences on the south side of the banks of the Thames, near Wandsworth, in Surrey and proceeds in a south-easterly direction, about nine miles and a half to Croydon; and from thence in a more southerly direction, eight miles to Merstham—making a total of eighteen miles. The rails consist of a flat plate, four inches wide, and nearly an inch thick, with a ledge to guide the wheels, three inches deep, by half an inch thick. The wagons weigh about a ton, and are five feet wide, eight feet long, and two feet deep, and are allowed to carry not exceeding three tons and a quarter. The wheels are of cast-iron, an inch and half in breadth at the rim, and thirty-two inches diameter: they

* Mech. Mag. † Abridged in the Register of Arts.

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revolve on conical axles, two inches three-eighths diameter after the shoulder, and an inch and a half at the linch-pin. According to Mr. Palmer's experiments, 1 lb. will draw 60 lbs. on a level part of the rails, at the velocity of two miles and a half per hour; or, one horse of average strength will draw a total weight of 900lb.

The coal-works near Leeds and Wakefield are connected with the neighbouring canals by numerous railways; and the town of Leeds is supplied with coal from the Middleton coal-works, by a rail-road, on which the wagons are impelled by steam-carriages. These carriages differ from those used in the neighbourhood of Newcastle and Sunderland; for, instead of depending upon the friction of the engine carriage wheels for reaction, the rails of the railway have cogs, or projecting teeth, into which toothed wheels, driven by the engine, work as a pinion works in a rack. This species of steam-carriage was applied by Mr. Blenkinsopp, in 1811.

The Deusbury and Birstal railway is to convey coals from the coal-works in Birstal parish to the vessels in the Calder and Hebble Navigation. Its extent is about three miles, and it was finished in 1805.

The Ashby-de-la-Zouch canal, which was opened in 1805, is terminated by a railway of three miles three-eighths in length, extending to the Ticknall lime-works, in Derbyshire; another railway of five miles to Measham collieries; and one of six miles and a half to the Clouds-hill lime-works.

The Derby canal has several railways that branch from it—viz. to Horseley collieries, to Smithey houses near Derby, four miles, and to Smalley mills, one mile and a half.

Railways also branch from the Cromford and Erewash canals; and the Charnwood Forest canal is connected with the river Soar Navigation by a railway two miles and a half in length, with a rise of 185 feet, called the Charnwood Forest railway.

The Chapel Milton to Loads Knowl railway, branches from the Peak Forest canal at Chapel Milton, in Derbyshire, to Loads Knowl lime-quarries in the Peake, a length of about six miles, with an inclined plane 515 yards long, and 204 feet fall. It was conducted by Mr. Benjamin Outram, engineer.

The Lancaster canal railway extends from Clayton Green, across the valley of the Ribble, to the top of its opposite bank, three miles and a quarter. The communication between the parts of the canal is effected by means of this railway, which has an inclined plane on each side of the valley, and the fall is 222 feet.

From the river Wye, near Mitchell Dean, a railway is laid through the forest of Dean to Lydney on the Severn, with a branch by Colford to Monmouth; and in the same neighbourhood, another railway extends from the Severn, five miles, to the collieries in the forest.

The peculiar advantages of railways for great changes of level is no where more fully exemplified than in the inclined planes of the Shropshire canal.

The Shropshire canal having to pass through a district where the changes of level were abrupt and considerable, it was thought expedient to adopt inclined planes for conveying the boats to different levels. The first inclined plane is 350 yards in length, and 207 feet in perpendicular height, with a strong double rail-road upon it, to admit boats loaded with five tons, and their carriages; the second plane is 600 yards in length, and 126 feet in height; and the third 320 yards in length, with 120 feet

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fall. The whole were designed by Mr. William Reynolds, who constructed a plane of the same kind in 1788, with a fall of 73 feet, for eight-ton boats.

In Cornwall, a rail-road, five miles in length, has been constructed, from the harbour of Portreth to the mines near Redruth.

And an extensive railway from Stockton, by Darlington, to the collieries on the south-west side of the county of Durham, is now completed. It proceeds from Stockton in a westerly direction, and about three miles and a half from thence, a branch to the south, of two miles, leads off to Yarm; the main line passes close by Darlington; and about four miles beyond Darlington, a branch to the south, of nearly two miles, leads to Pierce Bridge. About five miles further on the line, the Black Boy branch leads off in a north-easterly direction to the Black Boy and Coundon collieries: the extent of this branch is upwards of five miles. The main line continues past Evenwood, to near the Norwood collieries, and returns in a north-easterly direction, to the Etherly and Witton Park collieries. The total extent of the main line is about thirty-two miles: it is formed with edge-rails.

In Wales, the rail-roads communicating between the iron-works and coal-mines, and branching from the canals and rivers to the principal mining districts, are very numerous, and have proved very beneficial undertakings, both to the constructors and the public. The main rail-roads are joined by many smaller private ones, commonly called tram-roads, which give a great facility for traffic in a rugged country like it, where the common roads are very bad. In 1791, there was scarcely a single railway in South Wales; and in 1811, the complete rail-roads connected with canals, collieries, &c., in Monmouthshire, Glamorganshire, and Caermarthenshire, amounted to nearly one hundred and fifty miles in length, exclusive of underground ones, of which one company in Merthyr Tidvil possessed about thirty miles. The quantity is daily on the increase, and we shall only have occasion to notice the principal ones.

In consequence of the upper part of the Cardiff, or Glamorganshire canal, being frequently in want of water, the Cardiff and Merthyr railway, or tram-road, was formed parallel to it, for a distance of about nine miles, chiefly for the iron-works of Plymouth, Pendarran, and Dowlais

The Act of Parliament for this tram-road was obtained in 1794 (35th Geo. III.), by Messrs. Hompray, Hill, and Co.; and it appears to have been constructed under the first Act ever granted for this species of road. The width of the land allowed to be purchased was seven yards; and the whole length of the line is about twenty-six miles and three quarters. It is one of those cases where the ruggedness of the country renders any communication difficult; but there are certainly fewer difficulties to contend with in railways than canals in such districts.

It was on this tram-road that a trial was made of Trevithick's high pressure engine, on the 21st of February, 1804, for drawing the carriages. The same species of engine has been more recently applied, with better success, by Blenkinsopp and others.

The Aberdare canal, which branches from the Cardiff canal, is connected with the Neath canal by railways, the communication being completed by an immense inclined plane, up which the wagons are drawn by a high pressure engine.

The Sirhoway rail-road, or tram-road, commences from the Monmouth canal, at Pillgwelly, and passing through Tredegar Park, up the Ebwy

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river, at Risca, crosses that river by a bridge of sixteen arches; and following afterwards the course of the river Sirhoway, by Tredegar and Sirhoway iron-works, to Trevill lime-works, a total distance of about twenty-eight miles; and it is accompanied through all its extent by a good turnpike-road. From the Sirhoway railway there are branches to several collieries—one to the Romney iron-works, and others in two places to the Monmouthshire canal. One horse draws about ten tons down this railway, and returns with the empty carriages. The Act was obtained the 42d Geo. III.

The Brinore railway also leads from it, and is continued over the Black Mountain to the vale of the Uske, at Brecon, and from hence to Haye on the Wye. By means of this communication, the price of coals in the upper parts of the counties of Hereford and Radnor has been much reduced.

The Blaen-Avon railway also leads to the Monmouthshire canal: its length is five miles and a half, and it rises 610 feet in that distance, to the Blaen-Avon furnace.

The Caermarthenshire rail-road commences from the dock or harbour of Llanelly, and extends fifteen miles, through a productive coal country, to the lime works at Llanbedie; and from the eastern side branch railways to the extensive coal-works of General Waide. Its general objects are the export of coals, iron, lead, &c. The Act was obtained the 42d of Geo. III.

From Mr. Palmer's experiments, it appears that one pound will draw only fifty-nine pounds on a level part of this railway.

The Oyster-mouth railway proceeds from Swansea, seven miles along the coast, to the village of Oyster-mouth: it is intended chiefly for the carriage of lime-stone. Act 44th Geo. III.

Several other railways communicate with the Swansea canal from the coal-works in its neighbourhood.

The Abergavenny railway proceeds from the Brecknock canal, and passes by a bridge over the Uske to Abergavenny. From the same canal there is a railway branch to Uske and to Haye, and various others to coal and iron-works; and at the iron-works near Pontypool there are some lofty inclined planes.

The Ruabon Brook railway commences from an extensive basin at Ponteysylte, on the north bank of the river Dee: it is a double railway, and proceeds with a gentle ascent past Mr. Hazledine's iron-works, and through among numerous collieries to Ruabon Brook, a distance of three miles.

Of the Welsh railways, we shall only further notice the railway for conveying slates from the Penrhyn slate quarries, because it differs from the ordinary railways. The rest of the railways in Wales have flat or tram-rails, almost without exception.

Penrhyn railway, from the Penrhyn slate quarries in Caernarvonshire to Port Penrhyn, extends a distance of six miles and a quarter, and is divided into five stages: it has three-eighths of an inch fall in one yard, that is one part in ninety-six, and it has three inclined planes. This railway was begun in October, 1800, and finished in July, 1801. It has oval-formed edge-rails of cast-iron, four feet and a half long, and two feet apart. Two horses draw twenty-four wagons one stage, six times per day, and carry 24 tons each journey, or 144 tons per day. The wheels of the wagons are of cast-iron, fourteen inches diameter, and weigh thirty-five pounds. According to Mr. Palmer's experiments, it requires

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one pound to draw eighty-seven pounds on the Penrhyn railway, when the rails are level; while on the edge-rails of Newcastle, one pound will draw one hundred and seventy-six pounds: this difference arises from the smallness of the wheels used on the Penrhyn railway. But, imperfect as it is, it has been of great value to the proprietors of the slate quarries, by saving an immense expense in horse labour. The carriages are very low, and apparently convenient for conveying slates short distances—in fact, they are rather trams than wagons.

PRIZE CHRONOMETERS.

The annual public trial of these beautiful pieces of mechanism closed on the 31st of July, when the prize was awarded to a chronometer, Dent, No. 114.

	Mean Rate.		Extreme Variation between any two Days.
1828—Aug.	3″ ·43	1828—Aug.	0″ ·7
Sept.	3 ·85	Sept.	1 ·7
Oct.	3 ·73	Oct.	0 ·8
Nov.	3 ·87	Nov.	0 ·9
Dec.	3 ·93	Dec.	1 ·1
1829—Jan.	3 ·59	1829—Jan.	1 ·4
Feb.	3 ·59	Feb.	1 ·9
March	3 ·74	March	1 ·2
April	3 ·60	April	1 ·1
May	3 ·58	May	1 ·2
June	3 ·73	June	0 ·8
July	3 ·97	July	1 ·6

Greater rate in July	3″ ·97
Lesser rate in August	3 ·43
Actual Variation	0 ·54

From the above, it will be seen that its variations between any two months during the year is 0″ ·54, being a trifle more than *half a second!* The reward, though now comparatively small, answers the proposed end — the gradual improvement of the chronometer.*

WINDMILLS.

Mr. Church Mewes, of Manchester, has obtained a patent for various improvements in Windmills and their Sails. The first is an arrangement for varying the relative speed of the millstones, and the sails, to obtain the same speed in the stones with different forces of wind; which he effects by fixing on the same shaft a series of spur-wheels of different sizes, the largest being nearest the end of the shaft. These wheels are acted upon by a spur-wheel on a shaft placed parallel to the last, and connected by bevel-wheels with the main sails, or first mover of the machi-

* Register of Arts.

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nery. The different sized wheels are brought into contact with the driving wheel, as required by the frame which supports them being connected to the frame which supports the driving-wheel by rods, which act in a manner precisely similar to the action of the rods, which connect the two sides of a common parallel rule; thus, while the shaft, with the different sized spur-wheels, is carried forward, it is also brought nearer to the driver, so that a wheel of a smaller diameter is brought into gear with it. The second improvement is to render the helm sails, by which the main sails are adjusted to face the wind, more susceptible of the action of slight winds, by connecting a large vane with their axes, through a series of levers, so arranged, that the slightest turn of the vane will bring the helm sails to face the wind, and thus cause them to be acted on by a much lighter wind than what is required to act on helm sails without a vane. His third improvement applies to the main sails, the whips or arms of which he arranges so as to present to the wind an equal quantity of surface, though they are much shorter than those usually employed. He increases the number of the whips or arms, which are not made to radiate from the centre, but to proceed from points at some distance from it—the front arm proceeding in one direction, and the back arm in another, so as to give the required angle to the sail. These sails being much shorter, can be made much lighter than sails of the usual construction; and hence the top or movable part of the mill can be made considerably smaller—a circumstance of very great importance.*

AMERICAN PATENT HAMMERS OF CAST IRON.

In preparing to cast the hammers, a piece of iron is moulded with the pattern, against which iron the face of the cast hammer is run, and is consequently chilled and hardened. A small piece is likewise placed in the mould, to come in contact with the claw. The hammers after being cast are to be ground, and polished upon a buff.†

ENGRAVED PRINTING ROLLERS.

An invention has just been perfected, after great expense and incessant labour, which to calico printers is a grand desideratum. It is a machine by which the most minute and delicate figures may be etched on a cylinder, superseding the tedious process now in use, and without the slightest deviation in the pattern, if there be even tens of thousands of objects to be engraved. It is a truly astonishing invention; for besides all its other advantages, there is a considerable saving both in labour and expense, and it may be worked by a boy.‡

* Register of Arts. † Franklin's Journ.
‡ Monthly Mag.

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AMERICAN PATENT FOR MAKING PAPER OF THE HUSKS OF INDIAN CORN.

To one hundred and twenty-eight gallons of water, put in ten quarts of good lime, or about six pounds of good alkalies, and place therein about one hundred and ten pounds of clean corn husks, or flag leaves; let the water be moderately heated over a moderate fire, for two hours, when they will be ready for the engine, there to be worked, and managed in every respect as rags are, for the making of paper.

GIGANTIC STEAM-BOAT.

The Dutch have been engaged for the last five years in constructing and equipping a steam-boat of extraordinary magnitude, in order to facilitate the communication between Holland and Batavia: it has four masts, is about two hundred and fifty feet long, has cost upwards of one hundred thousand pounds, and has been appropriately christened the *Monster*. In consequence of her great length, she hung when going off the slips, and it was some days before she was fairly launched. One of the most remarkable features of this enormous vessel is, her extreme narrowness, as compared with her length, her greatest breadth of beam being only about thirty-two feet.*

IRON ROOFS.

Mr. Henry Robinson Palmer, of the London Docks, has obtained a patent for an improvement in the construction of warehouses, sheds, &c.; which consists in the application of iron plates riveted together, and strengthened by being fluted or bent, so that the roof, when completed, will have the appearance of the common pantile roofs. The intention of the bending of the plates is to give the roof, which is to be elevated in the centre in the usual way, sufficient strength to maintain its position without the introduction of rafters; and hence is obtained a roof which is at once light, economical, and well suited to the purposes proposed.†

BOOT HEELS AND TIPS.

Mr. Porter, of Carlisle, has obtained a patent for an improvement in iron heels or tips for boots and shoes. This improvement has for its object to render the iron heels or tips of boots or shoes lighter, and at the same time more durable, than those usually employed. This object is obtained by making them thicker at the places which are more subject to wear, and thinner in those places which are less subject to wear. Economy in the manufacture of an article of general use amongst that class of society whose circumstances preclude the possibility of their

* Mechanics' Mag. † Register of Arts.

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paying high prices for common necessaries, such as the one under consideration, is an object of the greatest importance—a circumstance which Mr. Porter has not overlooked, as he has contrived rollers with irregular grooves cut in them, to give to the different parts of the piece of metal the required thickness before it is bent into the form of the heel or toe of the boot or shoe. Into these rollers are fixed projecting studs, which mark, or pierce nearly through, the holes for the nails or screws by which the heels or tips are to be fastened to the boot or shoe.*

FRICTION OF SCREWS AND SCREW PRESSES.

An examination of the friction in screws having their threads of various forms, has led M. Poucelet to this very important conclusion—viz. that the friction in screws with square threads is to that of equal screws with triangular threads as 2.90 to 4.78, proving a very important advantage of the former over the latter, relative to the loss of power incurred in both by friction. †

THE KALLIFTHORGAN,

A new Musical Instrument.

This instrument, which is invented and made by a Mr. Frederick Fielig, is played upon in the same manner as the piano-forte, by means of a finger-board; but any person who heard it, and did not see how it was managed, would imagine that he was listening to a quartett, the parts of which were executed on the violin, the tenor, the violoncello, and the double bass. The way in which this effect is produced, is by a rosined bow of horse-hair, being, through the agency of a pedal, passed over the strings of the instrument, which are formed of catgut; and we only speak the truth, when we say that the instrument, when played upon by the inventer, could not be distinguished by a listener from a performance upon the violin, tenor. &c. The Kallifthorgan has a compass of considerable extent, from the highest note of the violin to the lowest note of the double bass; the middle part of the finger-board taking the notes of the tenor and the violoncello. There is, of course. a separate string for every note, and the Kallifthorgan is, in this respect, inferior to the four above mentioned instruments, because no performer upon it can insensibly slide from one note to another, in the same manner as a performer upon the violin can; for in this new instrument, as in the piano-forte, every different note has a separate string. It is well known that many instruments have been constructed, both in this country and abroad, on the same principle as the invention we are now speaking of. The idea was originally started in Germany, and was, we believe, first practically developed in that

* Register of Arts. † Brande's Journal.

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country; but as far as we know, none of the instruments hitherto made on this plan arrived at that perfection to which Mr. Fielig has succeeded in carrying his invention: for though they could be made to produce a continued tone like the violin, they failed in giving the swell, which can be so exquisitely produced upon that instrument. But in the Kallifthorgan the difficulty is overcome; and though the instrument produces notes of the most delicate and melodious tone when the keys are lightly touched, yet the most powerful sounds may be brought forth, either suddenly or gradually, by increased pressure. This instrument, therefore, in the hands of a judicious player, who understands how to manage it, is capable of the highest expression. Such, at least, was our impression on hearing the Kallifthorgan in a private room. It remains to be seen what effect it will produce on a public audience, and we understand it is to be immediately put to that test. The inventer displays much taste and judgment in his performance on this instrument, a perfect knowledge of the powers of which he may be supposed to possess.*

TABLE-FORKS AND KNIFE-SHARPENERS.

Messrs. Rogers, Hobson, and Brownill, cutlers, of Sheffield, have patented an improvement in table-forks, by which they can be applied to sharpen table-knives. This improvement, though principally applicable to carving-forks, may be applied with advantage to other forks. It consists in attaching to the stem between the handle and the root of the prongs three or more projecting pieces of steel fixed to it by a screw pivot, passing through their centres. The edges of these steels, which are slightly fluted, to produce a filing action on the knives, are curved so as to form the same angle with each other, whether their roots or points are brought in contact to act on the knives. These projecting steels, when applied to carving-forks form a guard; they are not much larger than the usual guard, and hence they become very convenient in use, as they are always at hand when required. This is certainly the best of the numerous knife-sharpeners on the same principle, which have lately been submitted to the public.†

PATENT STEAM-ENGINE BOILER.

By Dr. Undy.

This invention consists of an addition to ordinary boilers, by which the ill effects to which they are liable are prevented, when used at sea, or in a carriage, from the motion; and which will render all boilers more safe to which it is applied, and less likely to be essentially deranged. It consists of a pipe, or tubes,

* The Times. † Register of Arts.

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running from the upper part of one end, or side of the boiler, over its top, or along it laterally, to the opposite point, at or about the same height. Through this pipe, or duct, the steam, if from any cause compressed in one part of the boiler, will find its way to another, so as to render the action in all parts of the cavity regular and uniform; and to prevent a jet of the fluid from being thrown off by the safety-valve, from the agitation of the water in the boiler, in consequence of the pitching, or rolling, or lurching of a vessel or carriage, by which great waste is occasioned. These pipes may be made of copper, or other material thought best, and should be so much weaker than the boiler itself, that in the event of too great a pressure they may burst first, and thus prevent the destruction of that essential part, and the mischief likely to arise from it. They are also to have a cock at each end, so that, should one of them give way, on these cocks at its extremities being closed, the steam will be confined in the boiler, which will be as good as ever; and by keeping one or more of the pipes as a reserve, from which the steam is excluded, in the first instance, and into which it will be admitted, should an accident occur to the first set, the boiler will have all the advantages it possessed at first.*

PROPORTION OF POWER TO VELOCITY IN STEAM-BOATS.

The following table of the power necessary to give a steam-boat different velocities, has been published by Mr. Tredgold:—

3	miles per hour -	5½ horses' power.
4	- - - - - -	13
5	- - - - - -	25
6	- - - - - -	43
7	- - - - - -	69
8	- - - - - -	102
9	- - - - - -	146
10	- - - - - -	200

CANALS OF GREAT BRITAIN.

According to a calculation recently made, there are one hundred and eight canals in Great Britain, extending 2,682 miles, formed at an expense of thirty millions sterling.

SELF-WINDING CLOCK.

The *Connecticut Register* states, that a person in that state has invented a clock which winds itself up, and keeps correct time—strikes the hour regularly, and will continue to run until worn out, without the application of any power external to itself.

* Register of Arts.

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ECONOMY IN GAS BURNERS.

MR. LOWRY, of Greenock, gives the following account of his experiments to ascertain the best means of combining economy in the consumption of gas with the obtaining the greatest brilliancy of flame. Burners, whose circle of holes were 5-8ths of an inch in diameter, were tried with from five to fifteen holes in the circle, and the consumption was always the least with the greatest number of holes, though no great difference was observed when the holes were so near each other as to allow the jets to be perfectly united. An enlargement of the holes also produced a saving. When the central air aperture was stopped, or partially so, the flame rose considerably, but was conical and dull; but when the central and outer apertures were proportionally reduced, the flame became bright and cylindrical. On shortening the glass chimney, more light was obtained from a given quantity of gas; and on taking off the glass altogether, less gas was consumed in proportion to the light given out.

A perforated plate was laid on the top of the glass chimney, and the quantity of light was increased; and the same effect took place by using a glass whose diameter at top was equal to the openings found most advantageous in the perforated plate.

On doubling the height of the glass chimney, the flame fell to about one-half of its former height.

From the trials made by Mr. Lowry, he drew the conclusion that the greatest effect was produced when the holes were numerous, and rather large than small, the central aperture narrow, and the glass near the flame, the outer aperture being in such proportion to the inner as to keep the flame cylindrical. This construction, however, when carried to the extreme, being attended with the practical disadvantages, that burners being often placed in exposed situations, the least motion of air brings the flame in contact with the glass in such a way as to produce smoke, and the glass being intensely heated is more liable to be broken. He found it answered the purpose fully as well to enlarge the air aperture, making the glass chimney rather wider and shorter, reducing in this manner the speed of the air through it.

Experience, concludes Mr. Lowry, has shown that burners made on the plan last above described, answer the purpose of requiring less gas than other burners, and giving at the same time as brilliant, and perhaps a more beautiful flame.*

LEATHER-CLOTH BOOTS AND SHOES.

MR. HALL, of Plymouth, has invented a process for rendering cloth and other fibrous substances, glossy, resembling dressed leather, and impervious to the wet.

* Phil. Mag.

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The composition consists of one pound of bees-wax, eight ounces of Indian rubber, or gum, four ounces of resin, eight ounces of ivory-black, and four ounces of lamp-black, melted together by the application of a continued slow heat, or by boiling, and brought to a consistence which can be applied to the fabric with a brush, similar to that used in applying varnishes to different substances; the fabric is then stretched on the flat top of a vessel, and heated by water, in order to preserve a uniform temperature while the composition is being spread upon it. After the first coat of the composition has been dried by exposure in the open air, a second coat is to be applied in a similar manner, and for some purposes a coat of caoutchouc varnish is to be applied in the inside of the fabric, to render it perfectly impervious to moisture.

An establishment has been opened in the Strand, by Messrs. Hall and Co., for the manufacture of boots and shoes of this patent material, which they denominate *pannus corium, or leather cloth;* and they state that their boots and shoes will last longer than those made of curried substances, and that they are adapted to all climates, and have no tendency to crack.*

MACHINERY FOR MAKING BRICKS.

Mr. Mencke, of Park Place, Peckham, Surrey, has patented certain improvements in preparing material for, and in making brick. His improved method of preparing the materials consists in adding to the clay or brick-earth, after it has been mixed with chalk, a quantity of sulphuric acid, for the purpose of causing the materials to unite, and to dry more quickly. His method of manufacturing the bricks consists in placing the brick earth, when properly prepared, and mixed with chalk, sulphuric acid, and the other materials usually employed, on a frame subdivided into compartments the size of the intended bricks, which is placed on the lower stage of a compound press, consisting of a frame and stages similar to the usual packing presses; the upper stage is attached to a powerful screen, with a fly-wheel, and the lower stage to the piston-rod of an hydraulic press. The lower stage being thus loaded, is raised by hydraulic pressure to an appropriate elevation, when blocks to fit into the divisions of the brick-frame attached to the upper stage of the press are brought down upon the brick earth by the power of the fly and screw. The pressure is then removed from the bricks, by permitting a portion of the water to escape from the press, and the bricks are carried to an arch-roofed building, furnished with a fire-place and flue, and properly ventilated, to accelerate their drying. The process is completed by burning them in a building precisely similar to that in which they are dried.†

* Register of Arts. † Ibid.

AMERICAN PATENT LATH-SAWING MACHINE.

This is stated to be an improvement upon Phineas Slayton's machine for sawing hoops, lath, basket stuff, stuff for making riddles, window curtains, and window blinds.

The stuff is to be sawed out by gangs of circular saws, fixed upon spindles, at suitable distances from each other. The manner of gearing adopted by the patentee, it is unnecessary to explain; the principal novelty in it appears to us to be the using of two drums on opposite sides of the shaft or spindle which carries the circular saw; instead of one broad, there are several narrow straps passing over the spindle from each drum; and the friction is said to be lessened, and other advantages gained by this arrangement.*

NAVAL ARCHITECTURE.

From two draughts that have been presented to Sir Robert Seppings by Admiral Greig, two frigates of 60 guns have been built in the Black Sea, with a view to ascertain by actual experiment the truth of the principle as laid down by Romnie, the great French author on ship-building, viz. that the resistance the body meets with depends chiefly on the area of the greatest transverse section. The frigates are each about 171 feet long, and 44 feet broad. Their submerged part is a mathematical figure formed from the parabola; and the midships, and other transverse sections, with water-lines, are parabolas of different exponents. Both bodies have the same area of flotation and displacement, with the centre of gravity of displacement, and other elements of construction in the same relative position, but one has a much larger area of midship section than the other.†

CURIOUS SUN-DIAL.‡

Mr. John Abram, of Canterbury, teacher of the mathematics, and author of the Kentish Tide-tables, has constructed a curious sun-dial, which is to be fixed in the front of the Droit-house,

* Franklin Journal. † Hampshire Telegraph.

‡ We recommend the curious in *Dialling* to the description of a multiform dial, which formerly stood in Privy Gardens, Whitehall. It was invented by one Francis Hall, alias Line, a Jesuit, and Professor of Mathematics at Liege, in Germany, and was set up in the year 1669, by order of Charles II.; but for want of shelter from the weather, the iron-work, &c., soon became useless. Its explanation was, however, considered by mathematical men of the time as too valuable to be lost, and the Professor accordingly printed the description, at Liege, in 1673. It was reprinted in London, in 1685; and we last saw it appended to Holwell's *Clavis Horologicæ, or Key to Arithmetical Dialling*, 4to. 1712. The description would, of course, be out of place in a volume of modern inventions, like the present, but it will be found abridged in No. 400 of *The Mirror;* and judging it highly entertaining for all readers of *The Arcana of Science*, we take this opportunity of mentioning it.—Ed.

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Margate, below the transparent clock. The following are curious properties of this dial:—On the upper part is the hour-circle, to show the true solar time. Below the hour-circle is the Torrid Zone, on a large scale, with the parallels of the sun's declination (hyperbolic curves,) corresponding to every half-hour of the sun's rising and setting; these half-hours are again subdivided into quarters of an hour. The time of the sun's rising and setting for the day is indicated by the extreme point of the shadow of the gnomen traversing the corresponding parallel of declination, which, by its diurnal progress over the surface of the dial, also shows, at any given instant, the true bearing of the sun by the compass, indicated by vertical straight lines, marked with different points of the compass. There are, likewise, other parallels of declination, corresponding to the entrance of the sun into each sign of the Zodiac. In short, the dial points out the hour of the day, the sun's place in the ecliptic, the time of the sun's rising and setting, the length of the natural day and night, and the sun's true azimuth or bearing by the compass.*

PAPER LINEN.

A NEW invention, called *papier linge*, has lately attracted much notice at Paris. It consists of a paper made to resemble damask and other linen so closely, that it is impossible without examination to detect the difference: and even to the touch, the articles made from the *papier linge* are very much like linen. They are used for every purpose to which linen is applicable, with the exception, of course, of those in which strength and durability are required. A French paper, indeed, says that they are almost as solid as those manufactured from linen; but this cannot be possible. The price is very low: a napkin costs only five or six centimes (about a half-penny;) and when they are dirty they are taken back at half-price. A good-sized table cloth sells for only a franc (ten-pence;) and for the same price one may have a rouleau of paper, with one or two colours, for papering rooms, or for bed-curtains.†

VOLATILE OIL.

AT a time when locomotive engines are likely soon to be found traversing all the populous districts of the country, it becomes highly desirable that these moving furnaces should be so heated as not to annoy the inhabitants with a never-ending stream of smoke, and we have the pleasure to find that this *desideratum* can now be effectually attained. In the manufacture of resin and oil gas a large quantity of volatile oil is collected. This combustible liquid is now used instead of coal at the oil gas-works in Leeds to heat a bench of four retorts, which generate

* Register of Arts. † Literary Gazette.

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600 feet of gas per hour; and the heat is kept up during the day without the slightest variation, with two gallons of the volatile oil per hour, giving out neither the least smoke nor smell. The advantages of this discovery for the use of locomotive engines it is scarcely possible to appreciate; and it is not amongst the least of them, that two gallons of the volatile oil, weighing only 16lbs., will produce as much heat as 112lbs. of coal or coke, thereby diminishing the weight of fuel to be carried seven pounds in every eight.*

SPOTS ON THE SUN.

An ingenious individual in Providence is said to have succeeded by means of a seven feet telescope, constructed by himself on a new principle, in bringing the entire image of the sun into a darkened room, upon a white screen, to the size of eight feet in diameter. He writes that his astonishment was great when he perceived that every spot then upon the face of the sun, nine in number, was distinctly transferred to the screen, and was so plain that he could see every movement of them in their various and sudden changes. He says that he could plainly discover that those spots were immense bodies of smoke apparently issuing from volcanoes; and as they seemed occasionally forced upward from the craters, now forming dense clouds, and now dispersing; considers those phenomena as accounting for the rapid changes of those spots. The escape of such a vast quantity of gas from the interior of the sun would, he observes, as it surrounds that luminary, produce that bright and dazzling appearance which is the atmosphere of the sun. This theory may not accord with the opinions of others who have made observations on the subject, but the writer at any rate entertains the strongest belief of its truth. With the same instrument which is but just finished, he has also examined the moon, and states his conviction that that body is covered with perpetual snow, and in the dark spots discoverable on its surface being frozen seas, and the lighter spaces land covered with snow. Those circular places which have a rising cone in the middle, he thinks are extinguished volcanoes, as no clouds are perceptible over the moon's face, which being covered with snow and ice, accounts, as he imagines, for its clear atmosphere, or for the absence of an atmosphere. This vast accumulation of ice and snow upon the moon's surface may be explained, the writer conjectures, by the nature of the moon's revolutions. He offers to construct instruments of the above description by which these phenomena may be observed, at prices from 50 to 100 dollars, and at the same time to furnish solar microscopes upon a new principle, with a magnifying power at 12 feet distance of 5,184,000.†

* Leeds Mercury. † Boston Bulletin.

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EXTRAORDINARY PRINTING.

THE *Atlas* newspaper, published on the 14th of March, 1829, had 20,000 copies struck off in the space of a few hours; each copy containing 40 feet of printed superficies; therefore, 800,000 square feet of printed surface were produced, capable of covering an area of about 20 acres. This number of copies consisted of 320,000 leaves, measuring 16 inches in length, or of 640,000 pages, or of 1,920,000 columns, or of 241,920,000 lines, or 2,419,200,000 words. Assuming, therefore, that an ordinary octavo volume of 500 pages, each of 34 lines, and of 10 words in each line, contains 170,000 words, the press of the *Atlas* may be said to have printed in the course of a few hours, sufficient matter for 14,230 octavo volumes. If the 16 leaves of each copy be cut out and placed end to end, they would reach from London to Salisbury; and if each leaf be divided into its respective three columns, and similarly arranged, the printed slip then formed would be of sufficient length to go round Middlesex and the seven surrounding counties. The whole of the machinery by which these wonderful effects were produced, consists of two larger and two lesser cylinders, put in motion by a steam-engine of Maudslay's of four-horse power, managed by three boys, whose interference on the occasion was strictly limited to the presenting the end of the enormous blank sheet to the first cylinder, and to the receiving it in a few seconds, printed on both sides, as it was discharged by the last cylinder.*

ESCAPE FROM FIRE.

DR. BIRKBECK, in a recent lecture on fire-escapes delivered at the London Mechanics' Institution, noticed the difficulty which lies in the way of escape on occasion of fire, from the circumstance that the smoke renders the air completely suffocating, and the combustion deprives it of the power of supporting life; and individuals are therefore occasionally rendered incapable of making their escape even when there is no fire to obstruct them. He recommended among the means of escape which inhabitants of houses may always have in readiness for themselves an apparatus invented by Lieut. Cook, consisting of a cylindrical canvass bag, which is kept in its proper form by a circular wooden bottom, and a strong ring of iron at the top. This bag is suspended by a rope, which passes over a pulley, hooked to an iron bolt previously fixed to the brick-work; and the end of the rope being thrown into the street, is seized by the persons below, who lower the bag with the individuals it may contain through a circular hole in the bottom of a balcony which is attached to the window. Even without assistance from below, a person may lower himself in safety by winding the rope round the balcony;

* Regis. of Arts.

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and as the whole apparatus lies in a small compass, it may be kept in a room without inconvenience. In treating of the various inventions intended for facilitating escape in cases of fire, and mentioning with applause the contrivances of many ingenious individuals, Dr. Birkbeck said, that the rope-machines of Mr. Rider and Mr. David Davies were admirable contrivances of the kind, and, with slight exceptions, were nearly perfect. That of Mr. Rider consisted of a strong hempen rope, sallied with worsted, like a common bell-rope, and having at its upper end a swivel ring, with a spring catch, which might be instantly fixed to a bed-post, a chest of drawers, &c. By means of this machine, a person descended in perfect safety from the gallery to the platform, holding by the rope, and standing upon a kind of iron stirrup, with three rings through which the rope passed. These rings were not placed perpendicularly above each other, but stood in such directions as to cause a considerable degree of friction, and to prevent the too rapid descent of the person using the apparatus. A contrivance was connected with it, for instantly fixing a secure noose under the arms to be used when the friction seat attached to the machine (by which a person might even descend, holding another in his lap) was not employed. Another appendage to the apparatus was a ramp iron (to be fixed into the sill of the window) with a fork over which the rope was intended to pass, to prevent it from receiving injury while in use.*

FRICTION OF VARIOUS SUBSTANCES.

The following are conclusions from experiments by Mr. George Rennie, F.R.S., detailed in a paper communicated to the Royal Society. The friction of ice rubbing upon ice diminishes with an increase of weight, but without observing any regular law of increase. When dry leather was made to move along a plate of cast-iron, the resistance is but little influenced by the extent of surface. With fibrous substances, such as cloth, the friction diminishes by an increase of pressure, but is greatly increased by the surfaces remaining for a certain time in contact: it is greater, *cæteris paribus*, with fine than with coarse cloths; the resistance is also much increased by an increase of surface. With regard to the friction of different woods against each other, great diversity and irregularity prevail in the results obtained: in general, the soft woods give more resistance than the hard woods: thus, yellow deal affords the greatest, and red teak the least friction. The friction of different metals also varies principally according to their respective hardness; the soft metals producing greater friction, under similar circumstances, than those which are hard. Within the limits of abrasion, however, the amount of friction is nearly the same in all metals, and may

* Manual of Science and Literature.

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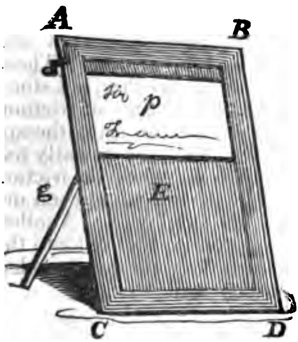
in general be estimated at one-sixth of the pressure. The power which unguents have in diminishing friction, varies according to the kind and the fluidity of the particular unguent employed, and to the pressure applied.*

APPARATUS FOR WRITING IN THE DARK.

This ingenious contrivance will be found worthy of the attention of our readers:



A B C D is a frame of wood, into the back and front of which two thin boards are inserted,— the front one, E, reaching about half the height of the frame, and the back one movable, by sliding in grooves, for the better fixing the paper to be written on (P) to a roller at top, attached to which is a handle and ratchet working into a spring.

To use it, the paper is fixed on the roller, and a strip of lead, or other weight, suspended from the bottom, for the purpose of keeping it smooth; then, by resting the right hand on the edge of the board E, and turning with the left hand the ratchet beneath A, the distance of the lines may be regulated by the number of clicks caused by the spring on the ratchet; *g* is a foot to support it; but it should be light enough to be held without trouble by the hand.†

ULRIC'S CHRONOMETER.

Some important improvements have been effected in time-keepers by a German of the name of Ulric, who has succeeded in reducing to practice several theoretical improvements, which had hitherto defied the skill of our best artists. In the patent marine time-keeper we are now describing, the irregularity, arising from inequality in the power exerted by the main-spring, is prevented by the transfer of the motive power to a spring lever; which, capable of receiving only a certain portion of power from the spring, can only impinge on the balance axis with a certain and determinate force. This force, invariably the same, will, of course, always impel with the same effect. To secure an isochronous motion, the spiral or pendulum spring is made perfectly taper, an object obtained only through the medium of an elaborate tool, constructed for the express purpose of reducing them to this form. The variation between the sea and the land rates,

* Phil. Mag. † Mech. Mag.

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in the best chronometers hitherto constructed, is remedied by the introduction of a balance, without iron or steel, consequently free from magnetic properties, or influence, yet possessing a compensating power, considerably more sensitive, and more active than any previously used, without any liability to permanent distortion of its true figure, by any transition from one temperature to another. The imperfection technically called *tripping*, and which is so frequently the cause of much error and mis-calculation, is entirely prevented; nothing short of a violence sufficient to destroy the machinery of the time-piece, can cause it to trip. They admit of being cleaned without disturbing their rates, and, indeed, without disturbing those parts on which the accuracy of their movements depends; a quality which every one, who has the use or care of chronometers, will be able to appreciate. The most inexperienced person may safely be entrusted to wind them up, no change of position being necessary, and no possibility of overwinding or winding wrong existing. An increased solidity is introduced into every part, diminishing almost to annihilation the risk of accident by any ordinary occurrence, and consequently, removing one very fruitful source of anxiety to the navigator.*

SETTING OF STEAM BOILERS.

In the setting of steam boilers, the usual width of the side flues is nine inches; the object of which has been to allow sufficient room for the passage of a sweeping boy to clear them of the soot. In some instances, however, this width has been reduced to four or five inches, and mechanical means resorted to for sweeping them. A double advantage results from this improvement, viz. a considerable saving of fuel is effected, and the degrading employment of the chimney-sweep superseded. The flues will require sweeping more frequently, by their being contracted in their dimensions, but by the removal of a brick or a plug or two, and the insertion of long-handled brushes, it is easily effected.†

* Monthly Mag. † Register of Arts.

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CHEMICAL SCIENCE.

EXPERIMENTS ON THE TORPEDO.

By Sir Humphry Davy, Bart. F.R.S.

The following paper, though read before the Royal Society nearly fifteen months since, is too important to be omitted:—

Amidst the variety of researches which have been pursued respecting the different forms and modes of excitation and action of electricity, it is surprising to me that the electricity of living animals has not been more an object of attention, both on account of its physiological importance, and its general relation to the science of electro-chemistry.

In reading an account of the experiments of Walsh, it is impossible not to be struck by some peculiarities of the electricity of the torpedo and Gymnotus; such as its want of power to pass through air, and the slight effects of ignition produced by the strongest shocks; and though Mr. Cavendish, with his usual sagacity, compared its action to that of a battery weakly charged, when the electricity was large in quantity but low in intensity, yet the peculiarities which I have just mentioned are not entirely in harmony with this view of the subject.

When Volta discovered his wonderful pile, he imagined he had made a perfect resemblance of the organ of the gymnotus and torpedo; and whoever has felt the shocks of the natural and artificial instruments, must have been convinced, as far as sensation is concerned, of their strict analogy. After the discovery of the chemical power of the voltaic instrument, I was desirous of ascertaining if this property of electricity was possessed by the electrical organs of living animals; and being in 1814 and 1815 on the coast of the Mediterranean, I made use of the opportunities which offered themselves of making experiments on this subject. Having obtained in the Bay of Naples, in May 1815, two small torpedos alive, I passed the shocks through the interrupted circuit made by silver wire through water, without being able to perceive the slightest decomposition of that fluid; and I repeated the same experiments at Mola di Gaeta, with an apparatus in which the smallest possible surface of silver was exposed, and in which good conductors, such as solutions of potassa and sulphuric acid, were made to connect the circuit; but with the same negative results.

Having obtained a larger torpedo at Rimini, in June in the same year, I repeated the experiments, using all the precautions I could imagine, with like results; and at the same time I passed the shock through a very small circuit, which was completed by a quarter of an inch of extremely fine silver wire, drawn by the late Mr. Cavendish for using in a micrometer, and which was less than the 1-1000th of an inch in diameter;

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but no ignition of the wire took place. It appeared to me after these experiments, that the comparison of the organ of the torpedo to an electrical battery weakly charged, and of which the charged surfaces were imperfect conductors, such as water, was more correct than that of the comparison to the pile: but on mentioning my researches to Signor Volta, with whom I passed some time at Milan that summer, he showed me another form of his instrument, which appeared to him to fulfil the conditions of the organs of the torpedo; a pile, of which the fluid substance was a very imperfect conductor, such as honey or a strong saccharine extract, which required a certain time to become charged, and which did not decompose water, though when charged it communicated weak shocks.

The discovery of Œrsted of the effects of voltaic electricity on the magnetic needle, made me desirous to ascertain if the electricity of living animals possessed this power; and after several vain attempts to procure living torpedos sufficiently strong and vigorous to give powerful shocks, I succeeded in October of this year, through the kind assistance of G. During, Esq., his majesty's consul at Trieste, in obtaining two lively and recently caught torpedos, one a foot long, the other smaller. I passed the shocks from the largest of these animals a number of times through the circuit of an extremely delicate magnetic electrometer, (of the same kind, but more sensible, than that I have described in my last paper on the electro-chemical phænomena, which the Royal Society has honoured with a place in their Transactions for 1826,) but without perceiving the slightest deviation of or effect on the needle; and I convinced myself that the circuit was perfect, by making my body several times a part of it, holding the silver spoon, by which the shock was taken, in one hand, wetted in salt and water, and keeping the wire connected with the electrometer in the other wet hand; the shocks which passed through the reduplications of the electrometer were sufficiently powerful to be felt in both elbows, and once even in the shoulders.

These negative results may be explained by supposing that the motion of the electricity in the torpedinal organ is in no measurable time, and that a current of some continuance is necessary to produce the deviation of the magnetic needle; and I found that the magnetic electrometer was equally insensible to the weak discharge of a Leyden jar as to that of the torpedinal organ; though whenever there was a continuous current from the smallest surfaces in voltaic combinations of the weakest power, but in which some chemical action was going on, it was instantly and powerfully affected. Two series of zinc and silver, and paper moistened in salt and water, caused the permanent deviation of the needle several degrees, though the plates of zinc were only 1-6th of an inch in diameter.

It would be desirable to pursue these inquiries with the electricity of the gymnotus, which is so much more powerful than that of the torpedo: but if they are now to be reasoned upon, they seem to show a stronger analogy between common and animal electricity, than between voltaic and animal electricity; it is however I think more probable that animal electricity will be found of a distinctive and peculiar kind.

Common electricity is excited upon non-conductors, and is readily carried off by conductors and imperfect conductors. Voltaic electricity is excited upon combinations of perfect and imperfect conductors, and is only transmitted by perfect conductors or imperfect conductors of the best kind.

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Magnetism, if it be a form of electricity, belongs only to perfect conductors; and, in its modifications, to a peculiar class of them.

The animal electricity resides only in the imperfect conductors forming the organs of living animals, and its object in the economy of nature is to act on living animals.

Distinctions might be established in pursuing the various modifications or properties of electricity in these different forms; but it is scarcely possible to avoid being struck by another relation on this subject. The torpedinal organ depends for its powers upon the will of the animal. John Hunter has shown how copiously it is furnished with nerves. In examining the columnar structure of the organ of the torpedo, I have never been able to discover arrangements of different conductors similar to those in galvanic combinations, and it seems not improbable that the shock depends upon some property developed by the action of the nerves.

To attempt to reason upon any phenomena of this kind as dependent upon a specific fluid would be wholly vain.

Little as we know of the nature of electrical action, we are still more ignorant of the nature of the functions of the nerves. There seems, however, a gleam of light worth pursuing in the peculiarities of animal electricity, its connexion with so large a nervous system, its dependence upon the will of the animal, and the instantaneous nature of its transfer, which, may lead when pursued by adequate inquirers to results important for physiology.*

October 24, 1828. Lubiana, Illyria.

SPONTANEOUS COMBUSTION.

Very recently some pulverized cobalt became so strongly heated as to take fire. The combustion was at first slow, and not perceived till the end of two or three days: the mass became then very hot and luminous, if ever so little stirred. It was covered and set to cool. Some days after, twenty pounds of it were packed up, without any renewal of the combustion; but nevertheless, on the following night, the package of cobalt set fire to the objects with which it was interlaid, and afterwards to the warehouse.†

DETERIORATION OF GOLD BY MERCURY.

(From the Ennis Chronicle.)

We beg leave to suggest the necessity of preserving gold coin, and all kinds of golden articles, from contact with quicksilver and all mercurial preparations. We have known several instances of gold rings bursting on the fingers of persons using mercury, or handling quicksilver. A few days ago, a gentleman in the country had a gold sovereign, in colour and excellence of execution not to be distinguished from several others in his possession, and of full weight and measure; but, on being slapped against a table, it sounded like lead, and on being pressed with the finger and thumb obliquely against the table, snapped in two

* Phil. Trans. † Bull. Univ.

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like a bit of rotten stick; he naturally concluded it was counterfeit and base coin, whereas we have no doubt it was a genuine coin that had come in contact with quicksilver. Indeed, this might possibly be the same sovereign which we saw about three weeks since, in a shop in this town, with the appearance of having been dipped in quicksilver, being partly silvered over, which appearance was removed by the application of aquafortis, at our suggestion. We wish some of our philosophic readers would inform us if there is any mode of recovering the precious metal from the deterioration occasioned by the contact with mercury.

ABSORPTION OF LIGHT.

THAT light or air, should constitute a portion of the earth on which they tread, is almost beyond the comprehension of uninformed minds; yet, if a familiar proof of the condensation of light were asked for, what more appropriate one could be furnished than the phenomenon of burning coals? The light emitted during the active decomposition of this substance, which is generally admitted to be of vegetable origin, has undoubtedly been condensed in it by a process of nature which bids defiance to conjecture.*

PERMANENT INK.

MR. MURRAY says, he found ink made of the following ingredients triumphant over the most violent chemical agencies, and of whose permanence in valuable records there can be no doubt:—

¼ oz. of a solution of nitrate of silver.
1 oz. - - - nitrate of iron.
¼ oz. - - - prussiate of ammonia.
½ oz. of tincture of galls.

A portion of finely levigated Indian ink and gum arabic added to these ingredients, is recommended by Mr. Murray. The fluid ounce is to be here understood.

BRACONOT'S INDELIBLE INK OR DYE.

TWENTY parts of Dantzic potash were dissolved in boiling water, and 10 parts of tanned leather parings, in small pieces, with 5 parts of sublimed sulphur, added; the whole was boiled to dryness in an iron vessel; then heated more strongly with continual agitation, but avoiding ignition, until the whole became soft; then a proper quantity of water was gradually added, and the whole filtered through a cloth. In this way a very dark coloured liquor was procured, which may be preserved for any length of time in well-corked vessels, constantly excluded from the air:

* Detrosier's Address to the Bankside Society, Manchester.

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this presents no difficulty to its use, for a pen-full is sufficient to write a couple of quarto pages. It flows more freely than ordinary ink, does not embarrass the pen with insoluble matter, and resists the chemical agents in such a way as to merit the title of indelible ink.*

TEST FOR COTTON IN CLOTH.

At a late sitting of the Royal Academy of Metz, the following method of detecting the presence of cotton in woollen stuffs was communicated. An ounce of pure alkali is dissolved in half a pound of water, and in this the suspected stuff is boiled for two hours. If the stuff is of pure wool, it dissolves entirely, and forms upon the surface a soap, which will pass through a fine sieve; but if, on the contrary, the stuff contains cotton, or any other vegetable fibre, it will not be entirely dissolved, but will show itself when thrown into the sieve.

IMPROVED PREPARATION OF CANDLES.

Steep the cotton wick in lime water, in which is dissolved a considerable quantity of the nitrate of potassa; chlorate of potassa answers still better, but it is too expensive for common practice. By this means is obtained a purer flame and a superior light; a more perfect combustion is insured; snuffing is rendered nearly as superfluous as in wax candles; and the candles, thus treated, do not run. The wicks should be thoroughly dry, before the tallow is put to them.†

COMPONENTS OF SWEET AND BITTER.

Dr. W. Herschel has discovered, that the mixing of nitrate of silver with hypo-sulphate of soda, both remarkably bitter substances, produces the sweetest substance known; a proof how much we are in the dark as to the manner in which things affect our organ of taste. So, bitter and sweet, as well as sour, appear not to be an essential quality in the matter itself but to depend on the proportion of the mixtures which compose it.

CRYSTALLIZATION OF GOLD.

By the Rev. John Stevens Henslow, Professor of Botany at Cambridge.

The crystallization of gold from a state of fusion is on record; but the author is not aware that any one has observed a similar effect to have resulted from its solution in acid. Perhaps, therefore the following notice may be worth inserting.

A small glass-stoppered vial, containing a solution of gold in

* Ann. de Chimie. † Brewster's Journ.

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a mixture of nitric and muriatic acids, had stood neglected for a considerable time (perhaps four or five years) in a cupboard. Upon accidentally examining it, I found a portion of the acid had escaped, and the gold crystallized. This effect had probably been promoted by a flaw in the vial, which extended through the neck, and a little way down its length. The stopper in consequence must have been slightly loosened, and thus allowed more space for the formation of a thin dendritic crystallization of the gold. This was further continued down the inner surface of the vial, and was there sufficiently thick to admit the impression of minute but distinct crystalline facets. A small crystallized lump of gold lay at the bottom of the vial; but I believe this had been originally attached to the rest, and merely by its weight, as I have since observed to be the case in another portion. Around the stopper, and along the flaw, there was a saline concretion, which tasted like sal-ammoniac, and as ammonia was kept in the same cupboard, it had probably united with the muriatic acid as it exuded. Upon finding this specimen, I examined some other metallic solutions, and found a similar separation of the metal had taken place in a vial containing a solution of platina, and in another containing a solution of palladium. In both these cases, a thin, interrupted, and dendritic lamina of metal might be seen between the stopper and the neck; but the crystallization had proceeded no further. I unstoppered the vial containing the platina, and the lamina (as might have been expected) immediately disappeared in the form of a slight muddy film. The palladium I still possess. Probably this phenomenon may be of frequent occurrence; but as the separation of the metal does not often extend below the neck of the vial, it may have passed unnoticed. These facts, if multiplied, may, perhaps, serve to throw some light upon the mode in which the dendritic laminæ of native gold, silver, &c. are formed in rocks.*

ROSIN GAS.

About two years ago, Mr. J. F. Daniel took out a patent for a mode of obtaining gas for illumination from rosin (or any other bituminous or carbonaceous substance, coal excepted.) Since then, an apparatus on Mr. D.'s plan, has been erected by Mr. Martineau, for the London Institution; and the result of the trial there made appears to place beyond doubt, that a much cheaper and purer light can be obtained from rosin-gas, than from either coal or oil gas. The burners in the London Institution consume about 1,000 cubic feet of gas per day, and this is effected by the destructive distillation of 100 lbs. of the common brown rosin of commerce, at a cost of about six shillings. Oil of turpentine is employed to assist the melting of the rosin, in

* Mag. Nat. Hist

the proportion of 10 gallons of the former to 100 lbs. of the latter; but the cost of the oil is not included in the six shillings, as the same oil may be used over and over again for any length of time. The illuminating power of rosin-gas, when compared to that from coal, is stated to be as two and a-half to one; and in point of purity, it is described as leaving nothing to desire.

QUALITIES OF GLAUBER AND EPSOM SALTS.

Glauber salts have been considered a more tonic aperient than Epsom salts. This is accounted for by the presence of a little iron in the one, and the absence of it in the other. According to the experiments of Dr. Davy, physician to the forces, out of six different specimens of glauber salts, five were found to contain a small quantity of iron, (probably the sulphate,) and one only to be free from iron. The iron was detected by aqua ammonia, added to the salt in solution; it occasioned a yellowish brown precipitate. Epsom salts may, no doubt, be made a tonic, by the addition of a very minute portion of iron, and particularly of the sulphate.*

DISCOVERY OF ARSENIC IN SULPHUR.

By means of caustic ammoniac 0.00061 parts of arsenic have been discovered in sulphur. To make the experiment, a certain quantity of milk of sulphur—of flowers of sulphur—or of common sulphur, should be subjected to the action of alkali; the liquid should be filtered, and treated with an excess of hydrochloric acid. If a yellow precipitate is produced, it is a sign that the sulphur contains arsenic. If no precipitate be perceptible, the liquid should be allowed to evaporate till a few drops only remain; a little ammoniac is then to be added, afterwards hydrochloric acid, and lastly hydro-sulphuric acid: the arsenic, be it in ever so minute a quantity, will make a yellow precipitate.†

ANALYSIS OF RHUBARB.

According to the analysis of Professor Peretti, who has lately subjected rhubarb to examination, that substance contains tannin, gallic acid, malate of lime, gum, sugar, fixed oil, volatile oil, resin, a solid yellow colouring matter, oxalate of lime, and fibrous matter. The ashes gave carbonate of potash, sulphate of potash, chloride of potassium, oxide of iron, carbonate and sulphate of lime, and silica. The resin is the active part of the rhubarb; according to Dr. Tagliabo, in doses of ten or twelve grains, it operates strongly, and without griping. A remarkable circumstance in the analysis of M. Peretti is the discovery of

* Jameson's Journ. † Geiger's Mag. für Pharm.

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sugar which had not been previously announced. Its presence was discovered by a process which he supposes to be applicable to a great number of cases. He boils the alcoholic tincture of rhubarb until it becomes colourless; he filters and evaporates. The sugar remains mixed with a little malic acid and gum.*

VERTICAL TEMPERATURE.

Mr. Ramond, in a memoir which was read lately before the French Academy of Sciences, remarks, that from the base of a high mountain to its summit the vegetation presents a foreshortened view of the same modifications which are observed from the same base to the poles. "I have ascended," he says, "the *Pic du Midi* (one of the Pyrenees, which rises 1500 feet above the level of the sea) thirty-five times, and have remarked that not a flower appears till after the summer solstice. The spring consequently does not begin at that height till the summer has commenced at the foot of the mountain." This peak is accessible during three months of the year only, and most conveniently in the month of September. In July and August it is not uncommon to see it covered with snow.

DIMINUTION OF THE DIP OF THE NEEDLE.

In the month of January a paper by Captain Sabine was read to the Royal Society, detailing the result of observations made by him in August last, in the horticultural gardens at Chiswick, on the dip of the magnetic needle in London, compared with the determination of the dip in the Regent's Park in August 1821, published in the *Philosophical Transactions* for 1822. The result obtained is the average of observations made with five different instruments. A decrease is found in the dip in London of 17′.5 in seven years, or an annual decrease of 2′.5.

The average annual decrease for the century preceding 1821 appears, from the most authentic observations, to have exceeded 3′. On examining the series of observations made on the dip in Paris since 1798. by MM. Humboldt, Gay Lussac, and Arago, the author had a corresponding indication of a recent diminution in the yearly decrease of the dip; it appearing by those observations, that the average yearly decrease in the first half of the period between 1798 and 1828 exceeded 4′.75, and in the second half fell short of 3′.

EFFECT OF OXYGEN GAS ON THE ANIMAL ECONOMY.

At a meeting of the Royal Society on the 26th of March, a paper was read, giving an account of several experiments made

* Jour. de Phar.

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by Mr. Broughton, surgeon in the guards, on inferior animals, with a view to ascertain the effect of pure oxygen gas on the animal economy. These experiments, to the number of eleven, were principally performed on rabbits, from three weeks old, and upwards, which invariably died after exposure for some time to an atmosphere of unmixed oxygen. After death Mr. Broughton found that the heart continued to act for some minutes; and that, in one instance, even the circulation proceeded uninterruptedly: for, on pricking the aorta, the blood spurted out in the same manner as during life. In the course of the inhalation of oxygen, the whole blood of the animal becomes arterial, that is, of a bright scarlet—appears to be thinner and more transparent—and is more readily coagulable. The surface of the lungs and the pleuræ are strongly injected at the same time, and seen in that state of congestion which must lead to suffocation. If, after the death of the animal in oxygen gas, there be a sufficient movement perceptible in the diaphragm, Mr. Broughton says that inflation of the lungs with common atmospheric air will restore the animal to life.

COLOURED FLAME OF SPIRITS OF WINE.

The professor Vogel, in a memoir read to the Assembly of Naturalists at Munich, in 1827, gave the following rules for colouring the flame of spirits of wine, either yellow, red or green. A yellow flame is produced by setting fire to the spirits over salt, of which the bases may be either ammoniac or soda, manganese, iron, mercury, platina, gold, nickel, cobalt, or bismuth. A red flame is obtained by making use of salts, the base of which is either lime, or strontian, or lithine, or magnesia. If the spirits be burnt over salts of copper, uranium, or alumine, a green flame is obtained. All the salts made use of should be soluble in alcohol. A green flame is also to be procured by dissolving in the alcohol boraic acid, or weak hydrochloric ether. It follows, from the experiments of M. Vogel, that the oxide of copper is reduced by burning alcohol, to protoxide and metallic copper, and that the green flame itself contains copper.*

NATURAL PRODUCTION OF SULPHURIC ACID FROM HYDROSULPHURIC GAS.

M. Egidi, druggist, of Ascoli, had observed in a spacious cavern, formed by nature in the district of Arquasanta, a violent disengagement of sulphuric hydrogen. This gas, in contact with atmospheric air, became gradually decomposed, and produced water and sulphur: the latter deposited on the sides of the cavern soon formed with its salifiable bases sulphites, and in the sequel, sulphates, principally sulphates of lime crystallized, and

* Journ. of Facts.

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lastly sulphuric acid, running down the sides of the cavern, and carrying with it the lime and other oxides which it found in its passage. This is not the only example known of constant fermentation of sulphuric acid, the effect of the decomposition of hydro-sulphuric gas.*

EXPERIMENTS ON THE PENETRATION OF WATER INTO BOTTLES IMMERSED TO A GREAT DEPTH IN THE SEA, MADE IN A VOYAGE FROM INDIA TO ENGLAND.

By Charles H. Weston, Esq. Communicated to Dr. Brewster.

THE bottles made use of were of white flint glass, with ground glass stoppers, round which, at the point of contact with the bottle, a quantity of putty was placed, and, embracing both lute and stopper, some linen was fastened, which prevented a removal of the lute during the descent of the bottle. This I found a simple, but effectual mode of rendering bottles water-tight, as the putty, independent of its oily nature, suffers a very considerable condensation by the pressure of the superincumbent water.

Some bottles were lowered to twenty fathoms, drawn up and examined, and again lowered an additional ten fathoms, and so on. Others were attached to the line at different distances, and four or five bottles were thus at the same time submitted to various degrees of pressure. It will be necessary to detail the fate of a few bottles only.

Two bottles were sent to thirty fathoms deep, enclosed in a fine netting, to receive the pieces in case of fracture. They were not only destroyed, but the minute state of division of a great part of the glass was such as to give one the idea of its having been literally pounded.

Hollow glass stoppers were most used, and, as they were beyond all suspicion hermetically closed, they were submitted to every degree of pressure. Several were destroyed; but one at thirty fathoms, and another at eighty fathoms, formed curious exceptions: they were cracked and half filled with water, but the water was effectually enclosed within them. Those that came up entire contained not the least water.

Two very strong bottles were then sent down, one to 140 fathoms, which came up quite empty, and the other to 120 fathoms. This last admitted half a tea-spoon full of water, but this was between the stopper, as the same bottle, fresh secured and sent to the increased depth or 140 fathoms, came up unaffected. This last bottle, containing sixty-five square inches of surface, must have suffered a pressure of at least ten tons.

Now, as under every circumstance and under every pressure (for mention is not made of half the number submitted to trial) the glass vessels were either broken or cracked, or had received

* Bull Univ.

nothing, it is fair to conclude with Dr. Green, that glass is impermeable.

I would also remark, that the case of the hollow glass stoppers exhibits a singular proof of the great elasticity of glass: for they had under strong pressure admitted water through those cracks, which so collapsed when that pressure was removed, as completely to retain that water.

The cracked stoppers, also, as they were but half filled, are incontestible evidence of the manner in which bottles generally are broken, not by being first filled, and then suffering from the expansion of water when under less pressure, as Dr. Green seems to think, but by actual pressure from without.

I might here subjoin, that a soldered tin canister, as being well calculated, from its flexibility, to show the manner in which vessels were affected, was lowered to 100 fathoms. It was bulged in and most severely compressed.*

SALINE LAKE OF LOONAR IN BERAR.

This curious lake is contained in a sort of caldron of rocks, amidst a pleasing landscape, and is of course the object of superstition. The taste of the water is uncommonly brackish. Mr. Alexander, who describes it, found by a rough analysis that one hundred parts contains—

Muriate of soda	- -	20 parts.
Muriate of lime	- -	10
Muriate of magnesia	- -	6

The principal purpose to which the sediment of the water is applied is cleansing the shawls of Cashmere: it is also used as an ingredient in the alkaline cake of the Mussulmans.†

AMYLIC ACID.

This acid, discovered by M. Tinnermann, is thus prepared:—Mix well and put into a retort equal parts of starch and black oxide of manganese, so as to fill one-fourth of it, and then a third part of water is to be added, and made to moisten the mixture equally; a receiver and safety-tube are to be adopted, and then heat is to be applied until the mixture nearly boils; 3 parts of muriatic acid are now to be gradually added; when the effervescence is over, and the contents of the retort are nearly dry, the distillation is to be stopped, to prevent any impure matter from distilling over. The product is impure amylic acid, scarcely coloured; and though it contains no hydrocyanic acid, it has a strong smell of bitter almonds; to free it from muriatic acid, the liquid is to be saturated with carbonate of lime filtered, evaporated till a pellicle forms, then allowed to cool and crys-

* Brewster's Journal. † Trans. Lit. Soc. Madras.

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tallize, and when the crystals of amylate of lime have been separated, the mother liquor is to be further concentrated. The crude amylate of lime is to be purified by further crystallization, until it does not precipitate nitrate of silver; then mixing 100 parts of these crystals with 73 of sulphuric acid, diluted with twice its weight of water, and distilling nearly to dryness, an aqueous solution of amylic acid is obtained.

This acid is sour, reddens vegetable blues, readily evaporates by heat, produces a sharp odour resembling that of hydrocyanic acid, and combines with bases to form neutral salts, most of which are deliquescent, and all are readily soluble. Some of its salts contain water of crystallization, and others none. The dry salts are decomposed by heat into carbonates and charcoal. The sulphuric, nitric and muriatic acids decompose these salts, producing carbonaceous precipitates. The neutral salts reduce nitrate of silver and muriate of gold. Amylic acid dissolves carbonate of lime with effervescence. The solution evaporated yields octangular crystals, mingled with plates. The salt is soluble in 4 parts of water, and scarcely in alcohol: its solution is decomposed by oxalate of potash. It consists of 42·16 lime, and 57·84 of amylic acid; the amylate of barytes crystallizes in four-sided prisms, and contains 37·29 barytes, 29·24 amylic acid, and 13·47 water; the salts of potash, soda and ammonia are deliquescent. Amylic acid is composed of 25 carbon and 3 oxygen.*

SALTPETRE FROM BEET ROOT.

M. Henri Braconnot has ascertained that the stem and leaves of the common beet, when dried and burned, yield ashes so rich in alkali, that it melts easily by heat, and surpasses many of the commercial varieties of potash.

APPARATUS FOR ASCERTAINING THE VALUE OF DIFFERENT ALKALIES.

The apparatus consists of a glass jar, about one inch in diameter, containing about five cubic inches, and graduated into inches and tenths; a dropping tube, about seven or eight inches long, divided into thirty equal parts; a porcelain mortar and pestle; a weight of one hundred grains, and a bottle of sulphuric acid, so diluted that the quantity contained in twenty-two divisions of the dropping tube will just saturate fifty grains of crystallized sub-carbonate of soda. To determine the point of saturation, litmus paper may be used, or, what is much more convenient, infusion of cabbage.

Method of Use.—The sample to be examined having been pounded sufficiently to pass through a coarse sieve, rub up some of it in the porcelain mortar, until it be reduced to a very fine powder; from this weigh one hundred grains, and return it into

* Bull. Univ.

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the mortar; add thereto boiling water, a small quantity at a time, and continue to rub it as long as any grittiness appears under the pestle; suffer it to stand a short time, and pour off the liquid into a pint or half-pint vessel, with a lip: add more boiling water to what remains, and again use the pestle, repeating this to ensure the perfect solution of all the soluble part of the sample, until about half a pint of boiling water has been employed; transfer the whole into the same vessel, stir it well together, and allow it to stand for the insoluble part to subside; when this is effected, measure off the clear liquor by pouring it into the graduated jar, and set it by for use; measure also the remainder, first shaking it up, and having noted the total quantity, this remainder may be thrown away. Take of the clear solution just one half of the whole amount of the two quantities, and add thereto about a table-spoonful of the infusion of cabbage; then, having filled the dropping tube to the upper division with the test acid, drop so much into the sample, constantly stirring the mixture, as will just change its green colour to crimson: the quantity of acid used, as indicated by the divisions on the tube, will show the per centage of alkali in the sample, if it be barilla, kelp, or manufactured soda; but, if the sample be pot or pearl ashes, augment the proportion of test acid used, by adding to the number of divisions indicated by the dropping tube, one half such number, and the total will be the per centage of alkali in such sample.

Should it be desired to ascertain the quantity of carbonic acid contained in the sample, we need only note the point at which the solution becomes blue in the foregoing process, and deduct the divisions then indicated by the test tube from the subsequent total amount; every ten of the remainder will then indicate seven per cent. of carbonic acid, whether of barilla or of potash.

The apparatus is made and sold by Mr. Bate, philosophical-instrument maker, 21, Poultry.*

APPLICATION OF A HIGH TEMPERATURE TO THE EVAPORATION OF LIQUIDS.

A MAKER of chloride of lime consulted M. Longchamp on the means of vaporizing a large quantity of muriatic acid, and the latter recommended a tube of platina. In a trial, one kilogramme (2.21 lbs.) of acid was vaporized in a tube three lines in diameter, and heated for eight inches of its length. A larger apparatus was then made, consisting of a tube two inches in diameter, and forty-two in length; but as four inches were external, at one end, two at the other, and four were included in the sides of the furnace, only thirty-two inches in length were heated, equal to a capacity of ninety-six cubical inches. With this one kilogramme of acid was evaporated in a minute, or 1500 kilogrammes in

* Brande's Journal.

twenty-four hours. A trial was made to support the platina tube by one of cast-iron, but the latter fused, and caused the former, which had become very brittle at the fusing part, to break; being, however, cut and repaired by soldering with gold, it was as good and effectual as at first.

From the effects produced, M. Longchamp concludes, that in high temperatures the evaporation is not in proportion to the heated surfaces, but in proportion to the capacity heated; that in a vessel heated to redness, it is eight times greater than at the usual temperature employed; and that tubes of platina may be used to vaporize large quantities of muriatic acid.*

ARTIFICIAL PREPARATION OF ICE.

After numerous trials made by M. B. Meijlink with different salts, for the purpose of converting water contained in a tin vessel into ice, during their solution, he ultimately gave the preference to a mixture of four ounces nitrate of ammonia, four ounces sub-carbonate of soda, and four ounces of water. This mixture, in three hours, produced ten ounces of ice; whilst with the mixture of sulphate of soda and muriate acid, he obtained ice only after seven hours.†

ODORIFEROUS LAMP.

The peculiar property which Dobereiner discovered in spongy platina, of causing the union of hydrogen and oxygen with extreme facility, and at temperatures much below those ordinarily required for the purpose, led him to examine into the chemical changes analogous to combustion, which other bodies could undergo by the same or similar means; and he soon found that alcohol vapour in the open air, and under the influence of the prepared platina, became converted into acetic acid. The experiment then became nearly the same as that founded upon Sir H. Davy's discovery of the power of a heated platina wire, in continuing the combination of combustible bodies and supporters of combustion without flame; and it ultimately gave rise to the formation of a lamp, which, containing alcohol, and prepared at the place of the wick with a piece of spongy platina, or, as Dobereiner calls it, sub-oxide of platina, or some other form of that metal, gradually converted the whole of the alcohol into acetic acid.

The lamp in this form has been used for a night-lamp; it gives light enough to see the time by a watch held close to it, and if more light be required, a piece of amàdou may be carefully inflamed at it, and then a light procured in the usual way. M. Batka has proposed to use Eau de Cologne in place of common spirit of wine, and finds, that then the fragrance diffused is

* Bull. Univ. † Brande's Journal.

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very grateful, being, in fact, occasioned by the actual formation of aromatic vinegar during the whole time the lamp burns. We doubt, however, whether a constant odour of this kind is desirable, unless indeed there be some bad smell to cover, and think that much more pleasure is derived from the inhalation of a perfectly pure and sweet atmosphere with the short occasional presence of fragrant odours, than from an atmosphere constantly, or for any long time, aromatized.*

PROPORTIONS OF OIL IN DIFFERENT OLEAGINOUS PLANTS.

According to some experiments of MM. Schuebler and Bentsch on the oils of Germany, the following species of plants yield per cent. of oil—

Filberts	60	Summer Rape	30
Garden cress	56 to 58	Woad	30
Olive	50	Carnelina	28
Walnut	50	Hemp seed	25
Poppy	47 to 50	Fir	24
Almond	46	Linseed	22
Navew	39	Black mustard	18
White Mustard	36	Heliotrope	15
Tobacco seed	32 to 36	Beech masts	12 to 16
Kernels of plums	33	Grape stones†	10 to 11
Winter rape	33		

ELECTRICITY OF THE SOLAR RAYS.

(Letter from Sig. Carlo Mattrucci, of Forli, to Professor Gazzeri.)

"I hasten, Sir, to communicate to you some experiments which appear to me to deserve the attention of philosophers. Having been for a long time persuaded of the existence of electricity in the solar rays, I wished to ascertain the fact by experiment. Having for this purpose exposed to the sun a delicate condensing electrometer of gold leaf, I soon perceived the leaves diverge and open themselves also on that side of the glass case which was directly exposed to the solar action, as if they had been attracted by it. Being induced from this first fact to suspect glass in this situation electrified, I was anxious to know if this were the case: wherefore, having left some plates of it in the sun, in a few moments I touched them in different places with the ball of the electrometer, when a very perceptible divergence ensued, which, however, was much more apparent when I touched the plates, although lightly, with a flat surface, since the effects of the friction and the pressure did not afford a doubtful result. I concluded, then, that the solar rays had the power of electrifying glass, and it only remained for me to ascertain if this effect were owing to the real existence of electricity

* Brande's Journal. † From the German.

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in these rays, or rather to the increased temperature of the glass, which I could easily determine, by heating a plate of glass, and trying it with the electrometer. This I did several times, but never discovered any signs of electricity. I observed, also, that the glass plate exposed to the rays of the sun never became electric if placed beneath another glass plate, or if the face of the sun was obscured by the intervention of a cloud. These few exceptions, which I have been induced to perform, seem to me sufficient to prove electricity in the solar rays. The influence of such a fact on the meteorological phenomena of terrestrial magnetism, and on so many other phenomena of nature, will, I hope, induce yourself and other philosophers to pursue the subject further."—*Antologia*. No. 100.

Forli, April 25, 1829.

Professor Saverio Barlocci, of Rome, in a Memoir on the Influence of Solar Light, in the production of Electric and Magnetic Phenomena, inserted in vol. xli. of the *Giornale Arcadico*, relates the following experiment he had performed, to ascertain the electric power of the solar light. Having decomposed it with a prism he made the red ray and the violet ray fall upon two discs of blackened copper, each of which was attached to a copper wire. Two nuts of the same metal, sliding upon a vertical glass rod, and to which the two wires were attached, permitted their being brought near together, or removed at pleasure. Having suspended a prepared frog by the body to the upper wire, the legs were placed upon the lower one. The apparatus being thus arranged, whenever (the discs being respectively covered with the red and violet rays) a contact was formed between the extreme parts of the two wires, evident signs of contraction were observed in the frog.—*Note by Prof. Gazzeri.*

Having experimented two summers since upon the solar spectrum, in exactly the same way, except that a very delicate galvanometer was used instead of a frog, no electricity could be obtained by means of an English sun.—M. F. *

SECRET OF THE COMPOSITION OF THE SCHWEINFURT BLUE.

A PORTION of a very fine blue pigment was placed in the hands of M. Braconnot, by M. Noel, for examination: it was the produce of a manufacture at Schweinfurt, where the preparation was kept secret. M. Braconnot readily ascertained it to be a triple compound of arsenious acid, hydrated deutoxide of copper, and acetic acid—so that it approximates to the green of Scheele. After various trials to form it, the following process was found to be the best. Six parts of sulphate of copper were dissolved in a small quantity of water; also, six parts of white arsenic, with eight parts of potash of commerce, were boiled in water, until no

* Brande's Journal.

further quantity of carbonic acid was disengaged. This hot solution was gradually mixed with the first, continually agitating until effervescence ceased; an abundant dull yellowish green precipitate was formed. About three parts of acetic acid were then added, or such a quantity, that a slight excess was sensible to the smell; gradually the precipitate diminished in volume, and in some hours a slightly crystalline powder was deposited at the bottom of an entirely colourless solution. The fluid was poured off as soon as possible; and the powder, washed with plenty of boiling water, to remove the last portions of arsenic, was then of a brilliant colour.

Care must be taken not to add to the cupreous solution an excess of arseniate of potash, as it causes waste of the acetic acid afterwards added, as the latter must be in excess. In repeating the process in the large way, an arseniate of potash, prepared with eight parts of oxide of arsenic, instead of six, was used, and the result was very successful. M. Braconnot thinks that probably a slight variation of the proportions he has given may be found advantageous; but in the mean time he considers it right to give the best process he is able for the preparation of a colour so beautiful, and which may be very valuable in the arts.

ODOURS AFFECTED BY ELECTRICITY.

M. Libri, of Florence, has lately observed, that when a continued current of electricity passes through an odoriferous body, camphor for example, its odour becomes weaker, and at length entirely disappears for a time. Camphor only resumes its original properties by degrees, and very slowly.

PREPARATION OF HARTSHORN JELLY.

The following process is due to M. Ferrez:—Four ounces of rasped hartshorn is to be steeped in eight ounces of water, acidulated with sixty grains of muriatic acid for ten minutes, and then washed carefully in two or three waters. It is then to be boiled with fresh water for half an hour, pressed through a cloth, and the liquid filtered whilst hot. This fluid is the jelly, which being qualified by sugar or other ingredients, and boiled slightly, gives, upon cooling, a perfectly clear and good jelly for the table.*

COMBUSTIBILITY OF CARBON INCREASED BY PLATINA AND COPPER.

The following experiment is due to Whœler:—Rasped cork is to be heated in close vessels with ammonio-muriate of platina, or verdigrise, when a charcoal will be obtained, which, though it will not inflame spontaneously, does so if slightly heated, and

* Jour. de Pharmacie.

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then continues to burn of itself. The charcoal obtained from cork without these additions does not inflame at so low a temperature, nor continue to burn in small masses, if once inflamed and left to itself.

This effect is analogous to that discovered by Dobereiner as belonging to platina; but, as regards copper, a more curious one of the same nature is shown very easily by a common green wax taper. These tapers are coloured with verdigrise, and, when burnt, the copper of the verdigrise is reduced for a time in the wick. If such a taper be lighted, and the flame then blown out, leaving the wick glowing, combustion of the wax will still proceed, slowly indeed, but for hours and days together, until the whole of the wax is burnt, or until the combustion has reached some part where it is extinguished by the contact of neighbouring bodies. This does not happen with white tapers, and hence they are safer for ordinary use. *

COLORATION OF GOLDEN ARTICLES OF JEWELLERY.

THE two best mixtures, according to M Castellani, for the purpose of giving a good gold colour to articles of jewellery, are as follows:—

Muriatic acid at 22° - -	10 parts.
Oil of vitriol - - -	4
Crystallized boracic acid - -	2
Water - - - -	150

Or,

Acid muriate of alumina (liquid)	13 parts.
Crystallized sulphate of soda -	4
Crystallized boracic acid -	3
Water - - - - -	150

Either of these mixtures, with twenty grains of neutral muriate of gold, constitutes the bath, which is to be used in the following manner:—A large glass matrass, carefully luted at the bottom, is placed over a circular furnace, so as to have heat readily applied to it; the solution is to be put into it, and when at the boiling point, the pieces of jewellery, previously cleaned and picked, are to be introduced, suspended upon golden wires. After a few minutes, a copper wire is to be immersed, and left until the gold has acquired a deep colour; it is then to be withdrawn, but the articles still left in until they have acquired the colour necessary. They are then to be put into warm water, acidulated by sulphuric or acetic acid, to remove particles of oxide of copper, washed in clean warm water, and dried near a fire.

Generally, a single operation is not enough; for, as a long immersion produces harm from the oxide of copper, it is better to shorten it, and repeat the operation. The colour produced by

* Brande's Journal.

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several immersions is always the best; that by one long immersion is red, and often requires the article to be entirely cleaned and recoloured.

The previous mixtures have been used for golden articles containing one fourth of copper; other alloys would probably require other proportions. When the articles are large and thick, the immersion should be longer than for small, thin, or narrow ones. As the bath is good in proportion to the gold it contains, when, by successive colorations, that has been removed, a few drops of muriate of gold should be added, and sometimes portions of the other constituents, and of water. The copper wire is oxidized in the process, and sometimes covered with a film of gold, in which case it should be changed or cleaned. If an intense yellow colour is required, the immersion should be frequently repeated, and the copper brought into contact. If a pale colour is required, the last immersion should be at the boiling point, and the copper wire ought not to touch.

Bronze articles, gilt by amalgamation, may be coloured in the same way; but M. Castellani has not as yet determined the best mixture for the bath.*

PECULIAR PRINCIPLE IN BLOOD, DISTINCTIVE OF ITS SOURCE.

This principle has been marked and described, and its utility in medical jurisprudence stated by M. Barruel. Whilst preparing the colouring matter of blood according to M. Vauquelin's process, the clot of ox blood was boiled with a large excess of sulphuric acid of moderate strength, on which occasion a strong odour of beef was observed. Some time after, having occasion to operate upon the blood of a man who had taken opium, the fluid was first coagulated by heat, and divided, after which it was boiled with weak sulphuric acid: immediately so strong an odour of the sweat of man was evolved as to infect the whole laboratory, and render it necessary for the persons to leave the place. This and the former fact combined, induced M. Barruel to extend experiments on these subjects, and the following are the results:

1. The blood of each species of animal contains a principle peculiar to each. 2. This principle, which is very volatile, has an odour resembling that of the sweat, or the cutaneous, or pulmonary exhalation of the animal from which the blood was taken. 3. In the blood this volatile principle is in a state of combination, its odour being then insensible. 4. When the combination is broken, this principle is volatilized, when it is easy to recognise the animal to which it belongs. 5. In each species of animal, this principle is more decided, or has more intensity of odour in the male than in the female; and in men, the colour of the hair accompanies certain variations in this principle. 6. This princi-

* Bull. Univ.

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ple is in a soluble state in the blood, and may be found, therefore, either in the unaltered blood, or after the fibrine has been removed, or even in the serosity of blood. 7. Of all the means of setting this principle at liberty, concentrated sulphuric acid has succeeded best.

To obtain these results it is only necessary to put a few drops of blood, or the serosity of blood into a glass, to add concentrated sulphuric acid, to the amount of one third or half as much as of blood, and to stir the whole together with a tube—the odoriferous principle being immediately rendered evident. By these means, M. Barruel can readily distinguish the blood from the following sources:

1. That of a man disengages a strong odour of the perspiration of man, which it is impossible to confound with any other. 2. That of a woman, by a similar odour much weaker, and resembling the perspiration of women. 3. That of the ox, a strong odour of oxen or a cow-house, or of cow dung. 4. That of the horse, by a strong odour of the perspiration of the horse, or of horse-dung. 5. That of a ewe, by a strong odour of wool, impregnated with the perspiration of that animal. 6. That of a wether, by an odour analogous to that of sheep, mixed with a strong odour of the goat. 7. That of the dog, the odour of the transpiration of a dog. 8. That of a pig, by the disagreeable odour of a piggery. 9. That of a rat, by the bad odour belonging to the rat.

The same result has been obtained with the blood of various kinds of birds, and even with the blood of a frog, which gave the strong odour of marshy reeds, &c.; and with that of a carp, which gave a principle smelling like the mucus which covers the bodies of fresh water fish.

Upon trials made to ascertain whether spots of blood could be distinguished, and referred to their source, M. Barruel found, that to a certain extent a pretty sure judgment could be given, even after fifteen days or more. The spotted linen is to be cut out, put into a watch-glass, and being moistened with a little water, is to be left for a short time at rest. When well moistened, a little concentrated sulphuric acid is to be added, and stirred about with a tube, then by respiring near it, the odour may be perceived. M. Barruel is not sure that the distinction could be ascertained after more than fifteen days, and therefore recommends legal officers to allow of no delay in any intended experiments which have to bear upon cases of judicial investigation.*

SYMPATHETIC INK.

A WEAK solution of nitrate of mercury forms a good sympathetic ink on paper. The characters become black by heat.

* Ann. d'Hygiène Publique.

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SULPHUR.

It is well known that sulphur which has been recently fused, does not immediately recover its former properties; but no one suspected that it required whole months, and even a longer period, fully to restore them.*

NEW SPECIES OF ETHER.

Alcohol saturated with sulphurous acid gas, kept many months, and then agitated with barytes in powder, decanted and distilled, has afforded a fluid more oily to the feel than alcohol, and of a peculiar acrid and etherial smell, seeming to indicate the production of a new compound, perhaps a new species of ether.†

SUGAR FROM STARCH.

M. Weinrich says, that from one to two parts of sulphuric acid for each 100 parts of potato starch is sufficient, if the heat applied be a few degrees above 212° Fahr.; and also that then two or three hours are sufficient to give crystallizable sugar. He applies heat in wooden vessels by means of steam.‡

THE PRESERVATION OF IRON FROM RUST

Has thus been discussed before the Society of Civil Engineers:

Mr. Clegg stated, that coal tar formed an effectual preservation to iron gasometers. Mr. Farey explained the principle of the common method of preserving iron, by dipping it when at a dull red heat into water, and immediately into linseed oil. The first part of the process frees it from the scales and extraneous matter, and the remaining heat disposes it to receive the oil, which forms a varnish, and filling up all the minute interstices of the surface, prevents the formation of any fresh film of oxide.

MEXICAN MODE OF AMALGAMATION.

The separation of the mercury from the silver is here a clumsy and comparatively an expensive process. Instead of using an iron retort with two parts, like an alembic, placed upon the common open French furnace, the antique *per descensum* method is the one resorted to. The amalgam is placed under a large bell of copper, which is encased for each operation with unburnt bricks, but so as to leave a space sufficiently great for the quantity of charcoal requisite to produce the heat required. The heat being lateral, the mercury rises towards the top, collects in globules, and falls through a funnel and tube, placed at the bottom of the bell, into a vessel of water beneath the whole; or

* From the French. † Jameson's Journ. ‡ Brande's Journ.

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the whole bell is filled with the vapour of mercury, which is condensed at the lower part. The furnace has a fanciful appearance, like the tombs of the middle ages—the bell being on the top and centre of a quadrangle of masonry, at the corners of which are four pillars of the same, supporting a pyramid, which serves as the dome of the furnace.*

SAFETY LAMP.

A VERY curious comparative statement has appeared in the *Morning Post*, of the number of explosions in coal mines, and the deaths occasioned by them, during the ten years which preceded, and the ten years that succeeded, the introduction of the safety lamp, invented by Sir Humphry Davy. From this statement, the accuracy of which we see no reason to doubt, it appears there were—

	Explosions.	Deaths.
From 1805 to 1816 - - -	9	284
From 1817 to 1828 - - -	19	360
Excess since the introduction of the Davy	10	76

The Editor of the *Morning Post* adds, that he thinks this excess is owing to the workmen relying so much on *the Davy*, that, under its protection, they now work in places where they would not have formerly ventured to take a light. The Editor of the *Mechanics' Magazine* attributes the blame to "the rapacious masters, who compel them to work there, or starve."

BARK OF THE SOAP TREE, OR QUILLAI SAPONARIA.

THIS bark, if pulverized and shaken in water, soon yields a solution, frothing as if it contained soap. It is obtained from a tree in Chili, known by the name of Quillai Saponaria, the trunk of which is straight, and of considerable height. The wood is hard, red, and never splits. The bark is rugged, divided, fibrous, of an ash grey colour externally, and white within. It contains a peculiar substance, pungent, soluble in water and alcohol, and frothing with water: this matter dries into thin transparent plates. It contains also a fatty matter, united to chlorophyle; sugar; a brown colouring matter dissolved by alkalies; a little gum; a free acid; malate of lime, starch, lignine, oxide of iron, and a small quantity of the muriates and phosphates of potash and lime.†

INSPIRATION OF INFLAMMABLE GAS.

IN consequence of the difference of opinion respecting the effects of this gas on the lungs, expressed by Scheele, Fontana, and

* Register of Arts. † Jour. de Pharmacie.

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others, the Italian philosopher Cardone lately instituted some experiments on the subject. The air being expelled from the lungs as much as possible, the mouth-piece of a bladder, containing thirty cubic inches of gas, was applied to the mouth, and the gas inhaled at two inspirations. An oppressive difficulty of respiration and a distressing constriction at the mouth of the stomach were the first sensations. These were followed by abundant perspiration; a general tremor over the whole body, seeming to commence at the knees; an extraordinary sense of heat, slight nausea, and violent head-ache. "My eyes," says Signor C., "beheld things but indistinctly, and a deep murmuring sound was in my ears. After a short time all these effects ceased, except that of heat, which increased in an alarming manner; but ultimately, by the abundant use of cold drinks, I was restored to my original state of health."

NEW PYROMETER.

By M. Pouillet.

THIS instrument is an oval vessel of platina, soldered to a tube of the same metal of known capacity; this vessel communicates with a graduated tube, so that the increase of volume occasioned by the rise of temperature may be immediately read. To use this pyrometer, the platina vessel is to be placed in the furnace, the temperature of which is to be known; the original volume of the air or gas contained in the instrument being known, the temperature is determined by the increase of its volume.*

FORMATION OF ACIDS IN VEGETABLES.

(By M. Vauquelin.)

I HAVE thought that, in a great number of cases, the developement of acids in vegetables was principally occasioned by the presence of alkalies. We find, in fact, the acids almost always neutralized altogether, or in part, by various alkalies, as lime, potash, soda, magnesia, and sometimes by vegeto-alkalies: and I do not know that the latter have ever been found in a free state in the vegetable kingdom.

The alkali which plays the greatest part in this respect is certainly lime, for it is most generally diffused, is most abundant at the surface of the earth, and powerfully attracts acids. It does not, certainly, enter into the organic kingdom in the state of lime, but as carbonate, which, without exerting any deleterious action on vegetables, still retains sufficient alkaline force to determine the formation of acids, and particularly the oxalic, which it prefers to all others.

We may thus, as I have said elsewhere, explain the effect of

* Journ. de Pharmacie.

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calcareous manure on vegetables. Immediately after its introduction into the organs of plants, the carbonate of lime determines the developement of an acid which decomposes it, and sets its carbonic acid at liberty, which, by means of light, is turned to account in the vegetable kingdom. From hence it may be concluded that calcareous manures fill two important functions—namely, the division of the soil, and the nutrition of the plants.*

POTATO BEER.

Dr. Hare having observed that there is a strong analogy between the saccharine matter of the sweet potato, and molasses, or the saccharum of malt, was induced to boil a wort made from the potato, of 1060 degs. specific gravity, with a proportionate quantity of hops, for the space of two hours. It was then cooled to about 56 degs. and yeast added. As far as Dr. Hare could judge, the phenomena of the fermentation and the resulting liquor were precisely the same as if malt had been used. The wort was kept in a warm place until the temperature was 85 deg. Fahr.; and the fall of the head showed the attenuation to be sufficient. Yeast subsequently rose, which was removed by a spoon. By refrigeration, a further quantity of yeast was precipitated, from which the liquor being decanted became tolerably fine for new beer, and in flavour exactly like ale made from malt. Dr. Hare has computed that five bushels of potatos would produce as much wort as three bushels of malt. It is to be considered, too, that the residue would, as food for cattle, be worth half as much as the potatoes employed.

POISONING BY CHEESE.

Dr. H. L. Westrumb, of Hameln, found that seven persons were poisoned by decayed or damaged cheese (*fromage passé, fromage gâté*). M. Sertürner analyzed this cheese, and found in it a peculiar acid, which appeared both to him and to M. Westrumb to be the poisonous principle. The analysis was performed with ether and alcohol. Three different substances were obtained from the cheese—viz.

1st. Caseate of ammonia.

2dly. An acid fatty, or resinous cheesy, matter.

3dly. An acid, but less fatty matter.

These substances, tried separately upon dogs and cats, showed that the first was the least poisonous, the third more so, and the second the most poisonous of all. The symptoms occasioned by the poison in these animals were similar to those occasioned in man: they were at first nervous, and then followed by intestinal inflammation. One phenomenon especially remarka-

* Ann. de Chimie.

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ble was the production of an enormous quantity of ammoniacal gas in the intestines: this resulted from an organic secretion, for the fatty poisoning matters did not contain any ammonia whatever.*

KEMP'S GALVANIC TROUGH.

(*See the Engraving.*)

MR. KEMP having ascertained the certainty that the distance at which the plates are placed from each other, exerts an influence on the nature of the electricity generated, in the farther investigation of the subject, constructed a battery where the plates were brought within the smallest possible distance from each other, which was about the 30th or 40th of an inch, to ascertain what effects would be produced from such a combination.

For this purpose, he constructed a common wooden trough, 16 inches in length, and two inches square, into which were placed 30 glass divisions at equal distances from each other. Each pair of plates, *c* and *z*, were connected by means of a slip of wire, *w*, soldered to them, the copper plates being previously perforated, to allow a repeated renewal of the liquor contained between the glass division *c*, and the copper plate *c*, so as to keep up the action on the zinc plate. The plates were then placed in the trough, so as to enclose a glass partition between them; the copper plate being brought as near as possible to the zinc plate, without being in actual contact, small pieces of oiled silk being used to keep them separate.

On the battery being charged, the effects on the deflagration of the metals, were similar to those produced by a battery of a few large plates; the effect on the needle was also very powerful; while the shock perceived was not more than half the strength of one got from the same plates in the form of a pile. This indicated that galvanism of a low intensity had been generated.

It thus appears, that although electricity of a low intensity is generated by plates of a large size, yet size is not the cause of this low intensity; but it is rather to be attributed to the small portion of intervening liquid the electricity has to traverse, which prevents its being increased in intensity.

Supposing now that four plates, each twelve inches square, composing a battery, were cut into plates four inches square, so as to form a battery of thirty-six plates, and so arranged as that the same distance of liquid may exist between each pair, as that which previously existed between each pair of plates in the large battery. The whole distance which the electricity of the first pair of plates will have to traverse, in passing from the negative to the positive pole, will be thirty-six inches of liquid; and every pair of plates will be of greater or less intensity, in proportion as the distance between the negative or positive poles is increased or diminished.

The electricity generated by the pair of plates at the negative pole, having the whole length of the liquid to traverse before it arrives at the positive pole, will be much more intense than that generated by any pair

* Journ. de Phar.

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of plates succeeding to the last, or that constituting the positive pole the distance of the liquid gradually diminishing through which the electricity has to pass.

If instead of arranging the plates so as to form a battery, having a distance between each pair of plates equal to the distance between each pair of plates in the large battery, we place them so that the sum of the distances between the thirty-six plates may be equal to the sum of the distance between the four large plates, we should then have electricity of the same intensity, were it not for the difficulty of having the liquid renewed, and also of expelling the hydrogen between the plates, which thereby prevents the continuous action which goes on when the plates are placed at a greater distance.

If a few plates of a foot square were arranged in troughs, at the distance of three feet from each other, Mr. Kemp is inclined to suppose that we should not have the igniting effects of the electricity of a battery of the same number of plates placed at the ordinary distance; but only the effects of a battery of the same number of plates, about four inches square, placed at the usual distance from each other. The chemical power of such a battery, however, would be increased.*

WINDSOR SPRING.

Captain F. Forbes of Winkfield-place, Windsor Forest, discovered two mineral springs some time ago on his estate: one, the analysis of which is stated under A, in the immediate neighbourhood of his mansion; the other mentioned under B, at some distance. Both these springs belonging to the magnesio-saline class, have since been used by a great number of patients; and the good effects which have been observed from their use have induced Captain Forbes to build a pump-room for the accommodation of the public.

A pint of the waters contains as under:

	A.	B.	
Carbonate of lime	6·0630	8·2507	grains
Sulphate of lime	9·8904	8·3064	
——— potash	1·3549	1·1382	
——— soda	15·5779	17·1761	
——— magnesia	20·8704	21·1920	
Nitrate of magnesia	2·6551	traces	
Chlorine of magnesia	19·6909	26·3169	
Silicia	0·5033	0·9210	
Alumina	0·5721	0·3938	
Extractive matter	traces	traces	
	77·1780	83·6951	
Carbonic acid gas } at 51° at the {	2·786	3·306	cubic inch.
Atmospheric air } tem. of the well {	0·611	0·611	do. do.
Specific gravity at 60° Fahr.	1·00737	1·00897 †	

* Edinburgh Journal of Natural and Geographical Science. (No. I.)
† Brande's Journ.

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BROMINE AND BROMIDE OF POTASSIUM.

These curious substances, which we believe have not been hitherto prepared in this country, have been imported for sale by Messrs. Allen and Co. Plough-court, Lombard-street. We need, perhaps, scarcely add our opinion that the quality of the articles in question may be fully depended upon.*

MATCHES FOR INSTANTANEOUS LIGHTS.

Oxygenated matches.—It is convenient to divide the manufacture of these oxygenated matches into two parts. The first consists in impalpably pulverizing the chlorate of potash, and intimately mixing the powder with flour of sulphur. A similar mixture violently detonates by percussion, or merely by the simple friction between two hard bodies, such as the pestle and mortar, or the muller and grinding-stone. M. Rochette, jun., an optician, residing in Paris, and who was one of the first persons who manufactured the oxygenated matches for sale, lost his life from a detonation, occasioned by preparing this mixture for use; and a loss was besides sustained, amounting to more than 1,200 francs.

In consequence of the great consumption made of these oxygenated matches, we cannot too much recommend the proper authorities to superintend the manufacturers, who prepare many pounds of this mixture daily, and to oblige them to remove their workshops to a distance from any habitation; and also to make a law, to prevent them from mixing the composition with gum-arabic. It is in vain they say, that the detonating mixture is modified, and that they have diminished the proportion of chlorate of potash, by substituting nitre in place of it; as it is a fact, that this new mixture is not less detonating than the former one!

The second part of the manufacture of these oxygenated matches, consists in making a thick fulminating mixture of the chlorate of potash, sulphur, and nitre, by tempering them with a sufficient quantity of a weak solution of gum-arabic in water. Sometimes the manufacturers add a little vermilion to the mixture to colour it red; but they frequently leave it of its natural colour, which is a pale yellow.

Detonating or Fulminating Matches, are those, which after being lighted by any means, at a certain period of their burning, make an explosion. These matches are more costly than the others; and, consequently, are only purchased by persons who know what they require. At present they are only sold by dealers in objects of philosophical amusement. The preparation of these matches is simple: it consists in making, by means of a small gouge, an excavation in the stem of the match, at about a third

* Phil. Mag.

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part of its length, from the prepared end of it; and raising up the loosened part of the wood, introducing into the hole, made at the farther end, an atom, either of fulminating silver, or fulminating mercury, but especially the former; and then glueing up fast the small slice of wood raised by the gouge.

Amongst the different methods invented in latter times, for obtaining a light instantly, ought certainly to be recorded that of a chemist at Stockton upon Tees. He supplies the purchaser with prepared matches which are put up in tin boxes, but are not liable to change in the atmosphere; and also with a piece of fine glass-paper, folded in two. Even a strong blow will not inflame these matches, because of the softness of the wood underneath; nor does rubbing upon wood or any common substance, produce any effect, except that of spoiling the match. But when one is pinched between the folds of the glass-paper, and suddenly drawn out, it is instantly inflamed.* Now we well know that detonating silver will readily explode by the friction of glass-paper, and is accordingly employed in many various ways, as in the laces, tapes, or girths of security, against housebreakers, &c. &c.;† and therefore these new instantaneous lights are no doubt formed, by its application to the points of these soft wood matches, and most probably in mixture with camphor, resin, sulphur, or other inflammable materials. Care ought, however, be taken in their use, lest, by falling upon a sanded-floor, and being accidentally trod upon, they may take fire, and thus do great mischief!

Prometheans are small glass bulbs, filled with concentrated sulphuric acid, and hermetically sealed, and surrounded with a mixture of inflammable materials, amongst which the chlorate of potash forms one; and the whole being again inclosed or surrounded with paper, also rendered still more inflammable by means of resinous matters. Upon pinching the end containing the glass bulb, between the jaws of a pair of pliers, the bulb breaks, and the sulphuric acid instantly kindles the surrounding materials. These Prometheans are, however, expensive; and care ought to be taken that the remains of the sulphuric acid, &c., do not come into contact with delicate furniture, clothes, books, papers, &c., lest it may lead to their destruction. The chief merit of this contrivance lies in securing the sulphuric acid from all danger of imbibing the moisture of the air, which is the great cause of the speedy failure of the acid bottles employed in kindling the oxygenated matches. These Prometheans are patented by the manufacturer of them.

We have now also to add to these numerous means of procuring instantaneous light, Dobereiner's discovery of the igniting

* Brande's Journ.

† As in the toys, called *Waterloo Crackers*, made in great numbers a few years since.—Ed.

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action of a jet of hydrogen-gas, when thrown upon a mass of the spongy platina, and which is now employed in a variety of ways.

The kindling of *amadou*, or German tinder, by the sparks produced from the collision of a flint and steel, now so very commonly used here in lighting segars, ought also to be included amongst the methods for producing instantaneous light. Mr. Gill, many years since, improved upon this apparatus, by substituting a loosely twisted cotton cord, steeped in a solution of pure nitrate of potash, for the German tinder, and which readily kindled by the sparks produced from the flint and steel. He did not, however, content himself with merely igniting the cord, and which required the use of a sulphured match to obtain a light from it; but he also prepared the cord, by coating portions of it at regular intervals, alternately with sulphur, and then with wax; the sulphur readily kindled of course, by the ignited match-cord, and as readily lighted the wax; and thus a flame was produced by one operation only. This flame endured sufficiently long to seal a letter, and perform other temporary offices; and might even be prolonged, by thus preparing the wicks of wax-bougies or candles of a greater length and thickness, with nitre and sulphur.*

POTATO SUGAR OBTAINED CRYSTALLIZED.

M. J. B. Mollerat, of Pouilly-sur-Saône, the proprietor of a manufacture of chemical products, has lately shown to strangers and merchants, who have visited his establishment, potato sugar in crystals, decidedly formed, and perfectly resembling very white sugarcandy.†

DR. WOLLASTON'S ELEMENTARY GALVANIC BATTERY.

Mr. Dakin in a lecture on galvanism, delivered at the Mechanics' Institution, as reported in *The Manual of Science and Literature*, explained a curious apparatus invented by Dr. Wollaston, which he called an *elementary galvanic battery*, and which consisted of a silver thimble with its top cut off. It was then partially flattened, and a small plate of zinc being introduced into it, the apparatus was immersed in a weak solution of sulphuric acid. With this minute battery, he was able to fuse a wire of platinum, one three-thousandth of an inch in diameter, a degree of tenuity to which no one had ever before succeeded in drawing it. Upon the same principle (that of introducing a plate of zinc between two plates of another metal) Mr. Children constructed his immense battery, the plates of which measured six feet by two feet eight inches; each plate of zinc being placed between two of copper, and each triad of plates being inclosed in a separate

* From the Recueil Industriel, with additions by Mr. Gill.

† Bull. Univ.

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cell. With this powerful apparatus, a wire of platinum, one-tenth of an inch in diameter, and upwards of five feet long was raised to a red heat, visible even in the broad glare of daylight.

ANALYSIS OF THE BATH WATERS.

According to experiments lately made by Mr. Walcker, and communicated to the *Quarterly Journal of Science*, the component ingredients of the Bath waters are not precisely such as have been hitherto stated. They are chlorine, sulphuric acid, carbonic acid, potassa, soda, lime, magnesia, oxide of iron, alumina, and silica. Besides these, the mineral water contains some extractive matter: its residue, when evaporated, being coloured, and containing an admixture of carbon, after ignition.

The following are the relative proportions of the ingredients first named, contained in 1000 grains:—

	Grains.
Potassa - - - - - - -	0.02256
Soda - - - - - - -	0.23591
Lime - - - - - - -	0.56894
Magnesia - - - - - - -	0.08175
Protoxide of iron - - - -	0.00213
Alumina - - - - - - -	0.00215
Silica - - - - - - -	0.04610
Carbonic Acid - - - - - -	0.08609
Sulphuric Acid - - - -	0.85471
Chlorine - - - - - - -	0.27017
	2.17051
From which are to be deducted -	0.06104
As the equivalent of oxygen for 0.27017 of chlorine leaving - - - -	2.10947 gr.*

TEMPERATURE OF WIRE CONNECTING THE OPPOSITE POLES OF A GALVANIC PILE.

In a paper communicated to the French Academy of Sciences in December last, and since published, M. Becquerel announces the result of experiments made by him with a view to determine the temperature of divers points of a wire traversed by an electric current. It is a well-known fact, that when the two poles of a voltaic pile are connected by a short wire, a proper charge will make the wire red hot in the middle. In explaining this phenomenon, it has been admitted that the temperature was equal at all points, but that the extremities being the first to feel the effects of refrigeration in consequence of their contact with the battery, the middle would show symptoms of a higher tempera-

* Brande's Journ.

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ture. M. Becquerel, in his experiments, in order that the cooling of the extremities by their contact with the battery might have as little effect as possible, used a long wire. The result proved that the temperature increases progressively from each end towards the middle: and consequently, that the cause which gives rise to an electric current, of which the intensity is constant at each point of the wire, acts as an accelerating power in the developement of heat.*

MEANS OF OBTAINING NITRATE OF TIN, OR THE PROTONITRATE.

This substance is successfully employed in some dye-houses in dyeing scarlet. It may also, says M. Chevreul, be used with advantage in the preparation of the purple precipitate of Cassius. The "Dictionnaire Technologique," after observing that this salt has such an avidity for oxygen, that it is difficult to unite its protoxide with the nitric acid, and also to maintain the combination of the two bodies, gives the following methods of obtaining it. Bring the acid into contact with the tin in a laminated state, or in the form of ribands, the acid being previously diluted with water until it marks about four or five deg. of the areometer. Having carefully enclosed it in a well-stopped vessel, leave it to act for several days. By degrees the metal passes into a protoxide, which dissolves without the extrication of much gas; nitrate of ammonia is afterwards found in the liquid, and which is supposed to be formed thus:—Part of the oxygen has been furnished by the water, and another part by the nitric acid, when completely decomposed; this afterwards becomes mixed with azote, and which finally unites with the hydrogen, to form the ammonia.

The protonitrate of tin can be obtained more pure and concentrated, by bringing the protoxide into immediate contact with the nitric acid, largely diluted; but this process requires that the protoxide be previously prepared, which complicates the operation. In employing this mode, the ordinary salt of tin (the protochlorate of tin) is dissolved in water; then filter it, and add ammonia in a slight excess to it; thus is formed an abundant white precipitate, which is the hydrate of the protoxide; then submit the mixture to ebullition. The precipitate changes its colour; it becomes at first grey, and then black; it acquires more cohesion, and is deposited more readily: it is now deprived of the water of combination which it contained. Suffer it to cool, wash it by decantation, and leave it to dry.

No more of the protonitrate of tin should be prepared at once than is required for use, as it readily decomposes. At the end of a short time, it forms a gelatinous deposit, which is nothing else than the sub-protonitrate.

* Bull. Univ.

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GUYOT'S PRESERVATIVE LIQUID FOR ANIMAL AND VEGETABLE PREPARATIONS.

The preservative liquid invented by Guyot, which may be used with great success in the preservation of vegetable and animal preparations, deserves the highest consideration, and may be prepared as follows:—

Take twenty litres* of the best brandy, and draw off from it, by distillation, five litres of alcohol; then add to the remainder an equal quantity of spring-water, and a pound of the flowers or leaves of lavender, and distil it anew to dryness. This done, we take nine parts of the alcohol drawn off in the first distillation, and mix it with sixty-nine parts of spring-water; and then add to the latter mixture an equal quantity of the liquid obtained in the second distillation. We thus form Guyot's preservative liquid, which possesses great clearness, has a taste of almonds, and a slight aromatic smell; and as it only contains about a thirteenth part of alcohol, so it is by no means expensive.

In using this liquid, the bottles containing the preparations may either be tightly closed with corks which have been steeped for some time in a composition of three parts of wax and one of suet, melted at a temperature not liable to burst or swell the corks. The mouths of the bottles are thus closed with flexible stoppers, the pores of which are rendered impenetrable, and thus prevent all evaporation of the fluid contained in the bottles.†

Mr. Gill thinks the method of closing the mouths of bottles containing anatomical preparations preserved in alcohol mixed with water, as practised by the late Mr. Taunton, an eminent surgeon of the metropolis, and a lecturer on anatomy, preferable to either of the above; it was as follows:—

He fitted to the mouth of the jar or bottle a thin circular plate of laminated lead, by laying it upon the mouth, and pressing it with his hand all around, in order to receive the impression of the exact form of the mouth upon the lead, and which he then cut to the shape with scissars, leaving it, however, rather larger than the mouth. He then applied a little lard around the mouth of the jar, and fitted the lead over it, burnishing its edges close down all around it. He then covered the lead with a piece of bladder which had been macerated in water till it had become gelatinous in consequence of incipient putrefaction, and tied the bladder closely all over and around the neck and mouth of the jar or bottle with twine. He then let it remain to dry, when he removed the twine, the bladder having cemented itself fast upon the bottle by its own gelatine. Lastly, he completed the security of the closure by painting the bladder all over with a black oil-colour, having previously trimmed away with his scissars the excess of the bladder below the tied part. In this way, he found

* The litre is equal to 61.02443 English cubic inches.

† Dictionnaire Technologique.

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that the liquid contained in the jars or bottles was effectually secured from escaping.*

NEW EXPERIMENTS ON THE COMBUSTION OF COAL-GAS.

The Rev. W. Taylor, of York, in performing some experiments on the combustion of coal-gas, has obtained results which promise to be of public importance. He has discovered very simple means by which the illuminating effect of a common argand gas-burner may be much increased, while its flame is proportionately enlarged. The following brief statement will show the nature of these experiments, which have been repeated by several members of the Yorkshire Philosophical Society, as well as by many inhabitants of York.

Exp. 1.—A piece of wire-gauze being laid upon the glass chimney of a common argand *gas*-burner, the flame is immediately enlarged to twice its former dimensions, and its light fully doubled.

(A similar experiment being tried within a common argand *oil*-lamp, or reading-lamp with a flat wick, the flame is often enlarged, but so discoloured as to yield less light.)

Exp. 2.—Place the finger, or a bit of cork, so as to close the lower opening of the interior air-passage of a common argand *gas*-burner:—the flame experiences a sudden enlargement, with an increase of light nearly equal to that in Exp. 1.

(The inner air-passage of an argand *oil*-lamp being closed, the flame is greatly deteriorated and darkened.)

Exp. 3.—The air-tube of an argand *gas*-burner being stopped as in Exp. 2, and the flame consequently enlarged, no further change happens when wire-gauze is laid on the top of the glass chimney.

Exp. 4.—Over the glass chimney of a *single-jet* gas-burner, wire-gauze being laid, produced no enlargement of the flame, and no increase of the light.

In an experiment at the rooms of the Mechanics' Institute, York, it was found that *one hundred* feet of gas were consumed in three hours and twenty-five minutes, by six argand gas-burners in the ordinary state; while the same gas-burners, *provided with wire-gauze caps* to their chimneys, yielded an equal light for an equal time, but consumed only about *fifty* feet of gas.†

PECTIC ACID AND THE JUICE OF CARROTS.

M. Vauquelin has analyzed the juice of carrots:—the following are the results of his examination.

The juice of carrots contains albumen, mixed with a resinous fatty matter and mannite.

* Gill's Repos. † Phil. Mag.

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A saccharine principle, which crystallises with difficulty; an organic matter held in solution by the agency of the saccharine principle; malic acid. The saline residuum yielded by the decomposition of the juice, is formed of lime and potash combined with phosphoric, muriatic, and carbonic acids; the latter results from the decomposition of the organic substances.

The residuum, insoluble in cold water, contains vegetable fibre, pectic acid, or the principle which yields it, supposing it not to exist ready formed; the saline residuum yielded by combustion consists of phosphate and carbonate of lime. The saccharine matter, deprived of the insoluble principle, dissolved by its agency, is susceptible of the vinous fermentation, but loses this property by the influence of this principle, and is converted into mannite. Pectic acid when heated in a crucible with excess of potash, furnishes oxalic acid.

Common water may be employed for washing the marc of the carrots; if the carbonated are substituted for the caustic alkalies, the acid is obtained in greater plenty and purity.*

DISCOVERY OF IODINE AND BROMINE IN SALT SPRINGS AND MINERAL WATERS IN ENGLAND.

Dr. Daubeny, professor of chemistry at Oxford, has discovered iodine and bromine in several salt springs and mineral waters of this country.

He has obtained the *latter* principle in a separate state from one of the Cheshire brine springs, and has fully satisfied himself of the existence of the *former* in two or three; but as he has not yet had time to ascertain the proportions in which they occur, must content himself, for the present, with this simple announcement of the fact.

He has found iodine not only in more than one of the Cheshire salt springs, but likewise in several waters containing purgative salts, such as those of Cheltenham, Leamington, Gloucester, and Tewkesbury; whilst bromine is of still more frequent occurrence, and is perhaps entirely absent from none of the English springs which contain much common salt, except that of Droitwich in Worcestershire, although the proportion in which it exists seems to vary considerably.†

TEST FOR VEGETABLE AND ANIMAL MATTER.

The nitrate of silver is the test which Dr. Davy thinks to be one of the best for detecting the presence of organic matter in solution. A pure solution of this salt is not altered by the sun's rays; but if the minutest quantity of animal or vegetable substance be dissolved in the water, the solution is discoloured; with common

* Annales de Chimie. † Phil. Mag.

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distilled water, the discolouration is strong. To prove that the cause of change assigned is the true one, it is only necessary to decant the colourless solution and expose it again to sunshine; however powerful the sun's rays, no further effect will be produced, unless a little more common distilled water be added, and then it re-appears. When used as a test for such substances, of course any chloride of silver that may be formed in consequence of the presence of muriates should be allowed to subside in the dark, and the subsidence should be complete before the fluid is decanted and exposed to light.*

PRESERVATION OF WINE MUST.

The following curious effect has been observed by M. Leuchs:—Charcoal was added to grape must, in the proportion of 100 grains to a litre (2·1 pints); or, if very much inclined to ferment, rather more charcoal was used. When the liquid had settled, and become clear and colourless, it was removed from the charcoal, and put into bottles or casks, to be closed up and preserved. It will not enter into fermentation, even in close vessels; for the charcoal has absorbed the ferment. Nevertheless, the ferment has not lost its powers by combination with the carbon; for, if left in the must, the latter begins to ferment, but only where in contact with the former.†

ADULTERATED FLOUR.

The method of detecting the adulteration of flour with potato flour, proposed by M. Henri, is to determine the quantity of gluten in the flour to be examined. Good unadulterated flour contains about 10¾ per cent. of gluten, as the mean of thirty different kinds of the crops of 1827 and 1828; whereas in the adulterated or mixed flour the gluten amounted only to 6 or 6½ per cent.‡

MALLEABILITY OF PLATINA.

At the Royal Society, on the 20th of November, 1828, a paper was read on a method of rendering platina malleable, by the late Dr. Wollaston, F. R. S. &c.§

In this paper the author details the processes which, from long experience in the treatment of platina, he regards as the most effectual for rendering that metal perfectly malleable. When it is purified by solution in aqua regia, and precipitation with sal ammoniac, sufficient care is seldom taken to avoid dissolving the iridium contained in the ore by due dilution of the solvent. The

* Jameson's Journal. † Bull. Univ. ‡ Jour. de Phar.

§ For this paper one of the royal medals was adjudged to Dr. Wollaston.—Ed.

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writer states the degree of dilution requisite for this purpose, and the exact proportions in which the acids are to be used. The digestion should be continued for three or four days, with a heat which ought gradually to be raised; and the fine pulverulent ore of iridium allowed to subside completely before the sal ammoniac is added. The yellow precipitate thus obtained, after being well washed and pressed, must be heated with the utmost caution, so as to expel the sal ammoniac, but at the same time produce as little cohesion as possible among the particles of platina. It is then to be reduced to powder, first by rubbing between the hands, and next by grinding the coarser parts in a wooden mortar with a wooden pestle, because the friction with any harder surface would, by producing burnished surfaces, render them incapable of being welded together by heat. The whole is then to be well washed in clean water. In this process, the mechanical diffusion through water is made to answer the same purposes as liquefaction by heat in the case of other metals; the earthy impurities being carried to the surface by their superior lightness, and the effect of fluxes being accomplished by the solvent powers of water.

The grey precipitate of platina being thus obtained in the form of a uniform mud or pulp, is now ready for casting, which is effected by compression in a mould, formed of a brass barrel, six inches and a half long, and turned rather taper within, so as to facilitate the extraction of the ingot when formed. The platina is first subjected to partial compression by the hand with a wooden plug, so as to expel the greater part of the water. It is then placed horizontally in an iron press, constructed so as to give great mechanical advantage to the power applied to produce compression. The cake of platina is then to be heated to redness by a charcoal fire, in order to drive off all the remaining moisture; afterwards subjected to the most intense heat of a wind-furnace; and lastly, struck, with certain precautions, while hot, with a heavy hammer, so as effectually to close the metal. The ingot thus obtained may, like that of any other metal, be reduced, by the processes of heating and forging, to any other form that may be required. It may then be flattened into leaf, drawn into wire, or submitted to any of the processes of which the most ductile metals are capable.

The perfection of the above method of giving complete malleability to platina is proved by comparing the specific gravity of a fine wire of that metal obtained by this process, which is found to be 21·5, with that of a similar wire drawn from a button which had been completely fused by the late Dr. Clarke, with an oxy-hydrogen blowpipe, and which the author ascertained was only 21·16. A further proof of the excellence of the method employed by the author is derived from the great tenacity of the platina thus obtained, as determined by a comparison of the weights required to break wires made of this metal so prepared, and

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similar wire of gold and of iron. These weights he found to be in the proportion of the numbers 590, 500, and 600, respectively.

An account is subjoined of the process for obtaining malleable palladium, by the intermedium of sulphur; and also of that for procuring the oxide of osmium in a pure, white, and crystallized state.*

EMBROCATION FOR PREVENTING OR ALLEVIATING SEA-SICKNESS.

The inventer of this embrocation (Mr. Derbyshire) has secured it by patent. It is made thus:

"Take of *crude opium* two ounces avoird. two drachms of *extract of henbane*, ten grains of *powdered mace*, and two ounces of *hard mottled soap*. Boil them in sixty ounces of soft water for half-an-hour, stirring well: when cold, add one quart of *spirits of wine* at sixty degrees above proof, and three drachms of *spirit of ammonia*."

Rub a dessert spoonful of this embrocation well in over the lower end of the breast-bone, and under the left ribs, the latest time you can conveniently do so previous to embarkation, and again on board as soon as you have an opportunity. The application must be continued till the sickness disappears.†

PREPARATION OF GERMAN SILVER, PACKFOND, ARGENTUM, OR ELECTRUM.

This is a new alloy, known by these different names; and is composed of copper, nickel, and zinc; and which imitates silver sufficiently well, owing to its whiteness, its hardness, and its unalterability.

The following are the processes employed in Germany to make *packfond*, as described by M. M. Robert and Co.—This alloy is formed in various proportions; and it is harder, and less liable to alteration, the more nickel it contains. Thus, for example, we may employ one part of nickel, two and three-quarters' parts of copper, and three-quarters of a part of zinc. This last alloy is more difficult to work, on account of its hardness; but as it is less liable to alteration, so we should give it the preference for various utensils for culinary purposes, as well as for the laboratory.

We must also observe, that the *packfond* is the better, accordingly as the zinc and copper, which enter into its composition, are the more pure; and they affirm, that the presence of a little lead in the zinc, greatly diminishes the malleability of the alloy.

Supposing then, that we are furnished with all the materials properly prepared, and have at command a wind-furnace with good bellows; we commence with pulverizing the spongy nickel, to which we add the necessary proportion of zinc, and place the mixture in a crucible, covering it with the requisite quantity of

* Phil. Mag. † Brewster's Journal.

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copper. When the crucible has been thus charged, and well covered, it must be placed in the furnace, upon a foot of baked clay, resting upon the grate of the furnace: the whole must be covered with charcoal, and exposed to the action of the fire. As the spongy nickel also contains some vitreous portions, and we must remove the scorias which float upon the surface; so, when the whole has entered into complete fusion, we must stir the alloy well with an iron rod, and which will also conduce to render the composition uniform in all its parts; we must then pour it into iron moulds, well polished inside, and which will form it into ingots, of about an inch thick. In order that these ingots may be conveniently laminated, we may make them about nine lines thick, nine inches long, and four wide.

However well the process may have been performed, yet we shall find at the summit of the ingot, a depression, occasioned by the contraction of the metal in cooling. Its fracture ought to exhibit a fine and close grain, without any air-holes: otherwise, we should find it, in working, to be a metal full of flaws and cracks.

We shall now give, after M. L. Bauhardt, a process for preparing *packfond*, which differs a little from the above. This consists, in taking thirty-two parts of copper, and eleven parts of nickel, in grains; these are to be put into a covered crucible, and heated until complete fusion takes place; they must then be well stirred with an iron rod, to render the mixture homogeneous; and when the whole is in complete liquefaction, it must be poured into water, and granulated; it is then to be well dried, and again placed in the crucible; and when heated to redness, eight parts of zinc are to be added; the whole is then to be covered with a proper defensive flux, and the fire must be urged by a strong blast; and when the whole is well fused, the scorias must be removed, and the alloy be poured into an ingot mould. The alloy thus obtained possesses, according to M. Bauhardt, a great degree of malleability, and is capable of being drawn into fine wire; and it presents the same appearance upon the touchstone, as silver of fourteen carats.

In order to polish the various articles made of *packfond*, we commence with rubbing them with pumice-stone, next with charcoal, and then burnish them with a hard polished steel burnisher; using at the same time soap and water, or beer. When the burnisher becomes dull, it must be brightened, by rubbing it upon a piece of buffalo-leather, impregnated with putty (oxide of tin and lead).

When there are cavities in the work, into which the pumice-stone cannot be made to penetrate, they may be blanched, by means of a solution of silver, or of tin, diluted with water.

The soldering of the *packfond* requires a great degree of attention in applying the heat, which must be done very gradually, if we would prevent cracks or flaws in it. It is generally soldered

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with an alloy of the *packfond* with tin; or still better, with fine silver.

In order to clean articles made of *packfond*, we may either use finely sifted wood-ashes, tripoli, or ivory-black, well washed and sifted.*

NEW DETONATING CAPS.

The carbo-azotic acid discovered by professor Liebeg, affords with lead, a combination, which detonates when it is compressed between two pieces of iron. This combination has the advantage of being less dangerous than fulminating mercury, for the preparation of the detonating caps. To obtain the carbo-azotic acid in a perfect state of purity, we gently heat, after first powdering it, East Indian or South American Indigo, of the best quality, with eight or ten times its weight of nitric acid. As it dissolves, it disengages a great quantity of nitrous acid fumes, and produces a considerable effervescence. When the scum is deposited, we submit the liquid to ebullition, and then add more nitric acid, until it no longer produces any nitrous acid vapours To be assured of this, we cover the vessel from time to time with a porcelain capsule, under which the vapours condense, when we can easily detect the presence of the acid. By taking this care, we shall neither form the resin of the indigo, nor any artificial tannin. When cold, the solution affords hard and transparent yellow crystals; we decant the mother-waters, and wash the crystals. Upon boiling the crystals in water they dissolve, and there will form upon the surface of the liquid oleaginous drops, which are termed artificial tannin; these must be removed by means of filtering paper. On filtering the liquid, and suffering it to become cold, we shall now be able to separate from it a great quantity of brilliant and lamellated yellow crystals. Finally, and in order to obtain the carbo-azotic acid perfectly pure, we again dissolve these crystals in boiling water, saturate the solution with carbonate of potash, and suffer it to cool. We thus obtain the carbo-azotate of potash in crystals, which we must purify by washing and re-crystallizing them repeatedly. We mix the first mother-waters with cold water, and then obtain a brown precipitate, which must also be washed. This precipitate must finally be dissolved in boiling water, and be neutralized with carbonate of potash, in order to obtain a new quantity of the carbo-azotate of potash, which must likewise be dissolved in boiling water. We then add either the nitric, the hydrochloric, or the sulphuric acid; when cold, the carbo-azotic acid will crystallize in lamina, of a clear yellow colour, highly brilliant; and the greater part of which take the form of an equilateral triangle.

Sometimes it will happen, that on treating indigo by the nitric acid, no crystals will form in the liquid. In this case we must

* Dictionnaire Technologique.

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evaporate it, and separate the acid from the residuum, in the manner above indicated. We may also pour off much liquid acid, which floats above the precipitate, and evaporate it to a proper degree. We then finally neutralize it with potash, after having boiled it anew with nitric acid. Four parts of the best indigo will yield one part of this acid. We can also procure it from silk and aloes.

We obtain the carbo-azotate of lead with this new acid, and the carbonate of lead. It forms a yellow precipitate, difficultly soluble in water; and which strongly detonates when heated.*

FRENCH PERFUMERY.

The *essential oils or essences* obtained in the south of France are those of *roses, neroli, petit-grain, lavender, wild-thyme, thyme, and rosemary.*

These essences are distilled in the usual manner. They obtain, by putting into the body of the still forty pounds of rose-leaves, and thirty pints (French) of water, and proceeding to distillation, fifteen pints of rose-water. They then continue the operation until they have thus obtained 200 pints of water, termed No. 1. In this first distillation, they obtain an almost imperceptible quantity of the *essence of roses;* but in the second it becomes more apparent; and, finally, in the fifth it becomes notable.

The house of Langier, senior and junior, annually make 250 ounces of essence of roses.

In the distillation of *orange-flowers*, they also obtain the *essence of neroli*, now become of remarkable importance. If they would obtain this essence they follow the ordinary process, and repass the waters of the first distillations upon new flowers. On the contrary, when it is intended to prepare orange-flower water of a good quality, they draw off a fifth part only of the water placed in the cucurbit.

The essence de petit-grain is obtained by distilling the leaves of the orange-tree; the quantity of essence they afford depends upon their freshness. With respect to those of lavender, wild-thyme, thyme, and rosemary, they present no peculiarities in their extraction.

Spirituous Essences.—Rose, orange, jasmine, tube-rose, cassia, violet, and other flowers.—They take three water-baths, furnished with covers, and put into one of them twenty-five pounds of one of the perfumed oils above-mentioned, and twenty-five litres of spirit, marking three-sixths; they stir the whole every three-quarters of an hour during three days; at the end of that time they decant the spirit thus perfumed, and pour it anew into the second water-bath; they again repeat the same operation in the third bath, and the spirit then obtained is perfected. By conti-

* German Journal.

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nuing the process with the same oil, they likewise obtain inferior qualities, and which they indicate under the terms, No. 2, 3, and 4.

Eaux de Cologne.—There are two processes which are usually employed in the preparation of *eaux de Cologne;* namely, distillation and infusion.

The first is now generally abandoned; but it is, nevertheless, beyond contradiction, the preferable one.

The only essences which are employed, and which afford this water its great celebrity, are the following: *bergamotte,* citron, lavender, rosemary, Portugal, and *neroli.* All these should be of the first quality; but their proportions may be varied according to the choice of the consumers.

The lavender waters are now indeed but little esteemed; nevertheless, for their virtues, they are in daily use; they ought always to be prepared from the fresh flowers, and not by a solution of the essence of lavender in alcohol.*

The following is also an excellent recipe for making Eau de Cologne equal to that of Farina, and at one-fourth of the price.

Take of the essence of bergamot, lemon-peel, lavender, and orange-flower, of each one ounce; essence of cinnamon, half an ounce; spirit of rosemary, and of the spirituous water of melisse, of each fifteen ounces; strong alcohol, seven pints and a half. Mix the whole together, and let the mixture stand for the space of a fortnight; after which, introduce it into a glass retort, the body of which is immersed into boiling water contained in a vessel placed over a lamp, while the beak is introduced into a large glass reservoir well luted. By keeping the water to the boiling point, the mixture in the retort will distil over into the receiver, which should be covered over with wet cloths. In this manner will be obtained pure Eau de Cologne.†

ALMOND PASTE

Is divided into three kinds; namely, brown almond paste, white sweet almond paste, and white bitter almond paste; but all of them are prepared nearly in a similar way.

The first is made of the kernels taken out of apricot stones, as also with almonds; these are formed into loaves, weighing five or six pounds each, and are then subjected to pressure, in order to extract the oil (300 pounds of almonds will yield about 130 of oil). The press is turned or squeezed closer every two hours, during three days; at the end of this time the loaves are withdrawn from the press, when they are dried, in order to be pounded; and lastly are passed through a sieve.

The second kind is obtained by scalding the sweet almonds in boiling water, until their skins become completely detached; they are then put into a basket and cooled, and the skins entirely

* Gill's Tech. Repos. † Granville's Travels in Russia.

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separated; when they are become dry, they are subjected to the same processes as the preceding.

The third kind is prepared as the second is, only that bitter almonds are made use of.*

METALLIC ELECTRICITY.

M. AUGUSTE DELARIVE of Geneva, has constantly observed, that the action produced by the elements of a pile ceases completely when these elements are placed either in a vacuum or in a medium which exercises no chemical action upon them. On the other hand, M. Delarive has repeated with success the experiments of an English chemist, who produced electricity by means of a pile composed solely of zinc. Of the two surfaces of each plate, the one is rough and the other polished. These plates, which, when placed at a distance from one another, only communicate by means of the ambient air, yet develope an appreciable electricity even without the assistance of the condenser. The consequences which result from these two series of experiments, with respect to the idea to be formed of the principal cause of the developement of electricity in the pile, are evident, and appear to us to be of a nature to modify the ideas of the learned world respecting one of the most important facts in natural philosophy.†

THORINE, A NEW EARTH.

M. BERZELIUS has lately discovered a new earth, possessing all the properties of that which bore the name of Thorine, and which was only a phosphate of yttria. On account of this great similarity, he retains the name of Thorine for the new substance. It is white, and incapable of being reduced by charcoal and potassium. After being strongly calcined, it is no longer attacked by acids, excepting by concentrated sulphuric acid. Even after being treated by the caustic alkalies, the sulphate of thorine is very soluble in cold water, but nearly insoluble in boiling water, so that it cannot be freed from several other salts by washing the mixture with boiling water. Thorine dissolves very well in carbonate of ammonia. Elevation of temperature determines the precipitation of a part of the earth: but on cooling the precipitate disappears. All the salts of thorine have a very pure astringent taste, almost like that of tannin. The chloride of thorine treated by potassium, decomposes with a triple deflagration. There results a grey metallic powder, which does not decompose in water, but which above a red heat burns with a brightness which nearly equals that of phosphorus in oxygen. Thorine is feebly attacked by sulphuric acid or nitric acid. Hydrochloric acid, on the contrary, dissolves it with a keen effervescence. The oxide of thorine contains 11.8 per cent. of oxygen. Its specific

* Gill's Tech. Repos.

† Jameson's Journal.

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gravity is 9.4. Thorine exists in a new mineral which has been found in very small quantities at Brevig, in Norway.*

OPIUM.

We should choose opium in small masses, well dried, and breaking with a neat and homogeneous fracture, of a reddish-brown colour, and of a strong odour, but without any mixture of empyreuma. When of a good quality it easily softens when pressed between the fingers; and it is susceptible of inflaming when brought near to the flame of a candle; but the best means which we can take, in addition to these characters, to be assured of its quality, is to determine, by experiment, the proportion of soluble matter which it contains.†

IMPROVED APPARATUS FOR PRODUCING INSTANTANEOUS LIGHT.

By Mr. George Jackson, Surgeon.‡

(See the Engraving.)

The objects which I have in view in constructing this apparatus, are simplicity and cheapness. In these I have so far succeeded, that the uncovering of the cup of platinum is now rendered unnecessary, and a taper is fixed in a situation to be lighted, by simply turning the cock; the instrument can also be sold at about one half the price of those in common use.

My attention was turned to this subject by frequently having occasion for a light, when called to the practice of my profession by night. I tried in succession the phosphorus bottle and the oxygenated matches, and was fitting up an instrument on Volta's plan, when Dobereiner's discovery of the action of hydrogen upon spongy platinum was made public. I then substituted a cup, with spongy platinum in it, for the electrophorus of Volta, and in that state used the apparatus for some time, before I thought of making any improvement on it.

The instrument consists of an inverted glass syphon, made of stout tube, about half an inch outside diameter, and having a bulb, about two inches and a quarter in diameter, blown on each leg of it. The bend of the syphon is cemented into a wooden foot, loaded with lead; and the bulb on the longer leg stands about six inches (measuring from centre to centre) above that on the shorter one. The tube extends about an inch above each bulb; that from the upper one is simply covered with a loose brass cap, more for ornament than use. On that which rises from the lower bulb a brass cap is cemented, into the top of which a conical or

* Jameson's Journ.

† Dictionnaire Technolog.

‡ Vol. XLVI. of the Transactions of the Society for the Encouragement of Arts, Manufactures, and Commerce. The Society voted its silver Isis medal to Mr. Jackson.

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tapering brass plug is ground, with a hole drilled partly across it, met by another hole drilled up the centre, so as to form a stop-cock. A jet, with a fine orifice, is screwed into the side of the cap, so as to communicate with the lower bulb, through holes in the plug, when the latter is turned into the proper position; and just below the jet an arm projects, which carries a short piece of brass tube lying horizontally, that serves to support the platinum, and protect it from accidental displacement. The end of a thin platinum wire is formed into a small helix or spiral cylindrical coil, of two or three turns, by winding it round a wire or glass rod, and is then to be covered with moist ammonio-muriate of platinum. It is then heated to redness in the flame of a spirit-lamp, again coated with ammonio-muriate, and again heated, so as at length to form a platinum sponge, from the size of a pepper-corn to that of a pea. The wire is then attached to a ring, made of a short piece of brass tube, of a size to admit of being pushed tightly into that piece of tube which is supported by the arm abovementioned; so that the platinum sponge hangs in the centre of the tube, directly before the jet. In the arm, between the jet and the platinum, and a little to one side, is a hole, just large enough to contain a piece of wax taper, the wick of which is thus placed, so as not to obstruct the jet of gas, but yet near enough to be lighted by it when it is inflamed. In the part of the tube between the bend of the syphon and the lower bulb, a cork, grooved at the sides, is inserted, to prevent the slips of rolled zinc from falling into the bend of the syphon.

To charge the instrument for use, the brass plug is taken out, and a number of narrow slips of zinc, about two inches long (cut from a piece of the thin malleable metal) are introduced into the lower bulb, which is then nearly filled with diluted sulphuric acid, poured through the upper orifice. As soon as a brisk action commences, the plug is replaced, and the gas, accumulating in the lower bulb, drives the acid into the upper one; when in quitting the zinc, the farther production of gas ceases. The lower bulb being thus filled with hydrogen, on turning the plug a portion of it escapes through the jet, becomes ignited by its action on the platinum sponge, and lights the taper: a portion of the acid at the same time descending from the upper bulb, acting on the zinc, and causing a fresh production of gas. It is not very material how much the acid is diluted. That which I have used is made by mixing one measure of oil of vitriol (sulphuric acid) with about ten measures of water, and it answers very well.

In the instrument in the Society's possession, the upper bulb is about six inches (from centre to centre) above the lower one. I have since made one, wherein the distance is only four inches, and I think it lights with rather less expenditure of gas.

To prepare the ammonio-muriate of platinum, a solution of the metal in nitro-muriatic acid is dropped into a solution of mu-

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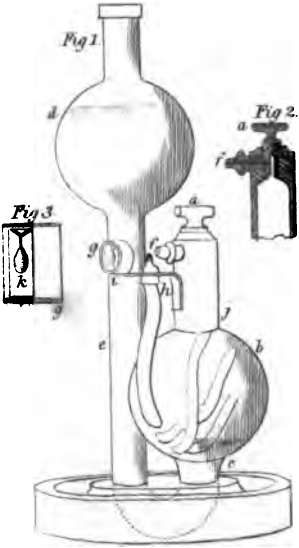
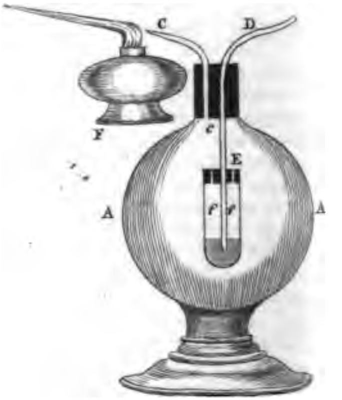
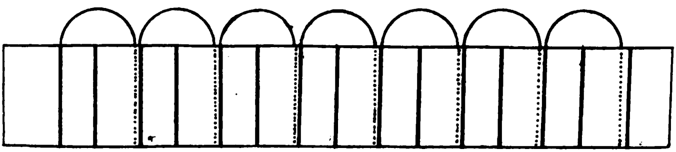


Apparatus for Instantaneous Light. p 143.



Kemp's Improved Blow Pipe. p 144



New Galvanic Trough. p 125.

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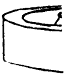

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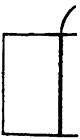

riate of ammonia in distilled water, and the yellow precipitate is collected in a paper filtre. Should it become dry, it must be moistened with *distilled* water, when using it to coat the platinum wire, and form the sponge.

In the Engraving, Fig. 1, *a* is the stopper, or conical plug, through which the zinc is introduced into the bulb *b*; it is prevented from falling lower than *c*, by a notched cork placed within the bend of the tube. Diluted sulphuric acid is poured in through the bulb *d*, till it fills the bulb *b*; the stopper *a* is then put in, and as the hydrogen gas is generated, the liquid is forced down through the bottom of the tube *c* into the tube *e*, and the bulb *d*, so that none remains in contact with the zinc. The stopper *a* also forms the plug of the cock, it being hollow, as shown in the section, in Fig. 2; and on turning its lateral aperture opposite to the jet *f*, the gas is pressed out by the weight of the fluid in *d* and *e*, and blows against the mass of spongy platinum, suspended upon the platinum coil in the short tube *g*: the platinum becoming red hot, kindles the jet of gas which heated it, and this flame lights the wax taper *h*, which is held in a hole formed in the arm *i*; this hole is placed so much on one side of the jet, as to let the wick only just touch the flame of gas; and the arm *i*, which holds the piece of wax taper, is soldered to the brass neck *j*, and to the tube *g*. Fig. 3 is a full sized section of the tube *g*; within it slips a shorter ring of tube *k*, round the upper part of which the fine platinum wire is wound and twisted, which holds the spongy platinum; and thus the platinum, though hanging free of the sides of the tube, and thereby more quickly becoming red hot, than if in contact with it, is protected from accident, and is always placed opposite to the jet of hydrogen gas.*

IMPROVED BLOWPIPE.

By Mr. K. T. Kemp.

(See the Engraving.)

The importance of the blowpipe as an instrument of chemical analysis, and of extensive application in the arts, is so well known, that I do not here require to make a single remark on the subject. It has undergone many modifications, from that of the simple bent tube, to the more efficient instrument when in the form of a hydraulic machine.

All of them, however, either occupy too much space, are not portable, and are too complicated, or, if not, as in the case of the bent tube, they are hurtful to the lungs, and cannot be used but with much inconvenience, from the necessity of keeping up a continued blast.

The one I am now about to describe is very portable, requires almost no exertion of the lungs, one expiration into it being sufficient to produce a continued blast for about two minutes; and it also occupies very little space.

It consists of a glass-vessel of a globular shape A B, into the neck of which a cork is fitted, and made perfectly tight by a sealing of wax;

* Gill's Repos.

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through the cork pass two tubes C *c* and D *d*, about a quarter of an inch in diameter. The one, C *c*, terminates at the under surface of the cork *c*, and is open into the vessel; it is bent as shown in the figure, and is brought at its extremity C to a fine point, for emitting a stream of air to urge the flame. The other tube, D *d*, also passes through the cork, and is terminated into a bottle-like tube E *e*, a sufficient space being left between the under part of the tube D *d*, and the bottom of the bottle E *e*, for the passage of the air, which is forced in at the other extremity of the tube at D. The small bottle-like tube E *e* contains a portion of mercury, below the surface of which the tube D *d* terminates, after passing through a cork at the upper part of it E, and to which it is firmly attached by means of a sealing of wax; two small openings *f*, *f*, are cut in the cork, to allow the air to pass freely through, into the large glass-vessel.

A small stand F, for supporting a spirit-lamp, is attached to the neck of the vessel, which may be raised or lowered by a screw, to allow the flame to be acted upon by a stream of air, as it issues from the tube C.

In using this blowpipe, all that is necessary is to adjust the lamp, by means of the screw and stand, till it be opposite the tube C.

If we then blow into the tube D *d*, we shall force in a quantity of air, which passing through it, and the mercury contained at the bottom of it, in the bottle E *e*, rises and is forced through the openings *f*, *f* into the large vessel. This additional quantity of air within the vessel, exerts a pressure on the surface of the mercury, and raises a column of it in the tube D *d*, which, acting as a valve, shuts the communication between the internal and external air, and effectually prevents any of it from returning through the tube D *d*, while, at the same time, the condensed air within the glass-vessel, from its greater elasticity, flows through the other tube C upon the flame of the lamp; and as a period of from one to two minutes elapses before it arrives at the density of the atmosphere, a continued stream of air may be made to act on the flame, by occasionally blowing into the tube D, while the operator has the free use of both hands, which is of some importance in experimenting on minute portions of matter.

The instrument may be rendered more perfect, by having a stop-cock placed in the tube C, to regulate the current of air; for most purposes, however, this is unnecessary.

Instead of the tube D *d* being terminated in E *e*, it might have been continued to the bottom of the vessel, and be there terminated in a portion of mercury. This construction would answer equally well, if the instrument was to remain stationary; but, during motion, it sometimes happens that the mercury is removed from the bottom of the tube, and the elasticity of the air acting on that column of mercury within the tube, forces it out at the orifice D.

The same principle of constructing a valve may be applied to the hydraulic blowpipe. The tube coming from the bellows, instead of having a common valve inserted into it, and terminating at the *top* of the air-vessel, may be continued to the *bottom* of it; when, upon the air being forced in by the bellows, it displaces the water from the tube, and rises into the upper part of the air-vessel. The water now acts as a valve, and prevents the return of the air by that tube, while it is forced out by the other tube in the usual manner.

By this plan we obtain a valve of the most simple description, and

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without the possibility of getting wrong; nor is there a greater pressure required for forcing in the air by this method, than when the tube terminates at the top of the air-vessel through a common valve.*

DIRTY WINDOWS.

We have frequently remarked small radiant and arborescent crystallizations on dirty windows in London, and have found them to consist of *sulphate of ammonia*. This salt, or at least, sulphite of ammonia (which becomes sulphate by exposure to air) is an abundant product of the combustion of coal.†

FULMINATING POWDER.

According to M. Landgerbe, a mixture of two parts nitre, two parts neutral carbonate of potash, one part of sulphur, and six parts of common salt, all finely pulverized, makes a very powerful fulminating powder. M. Landgerbe adopts the extraordinary error of supposing that these preparations act with more force downwards than in any other direction.‡

GALVANISM.

Mr. Becquerel has discovered that the temperature of a conducting wire communicating with the two poles of a pile, increases from each of its extremities, and constantly reaches its maximum in the middle of the wire.§

MUSK.

Dr. Davey, by some recent experiments, has proved that when musk, in admixture with quicklime, smells of ammonia, it is impure or adulterated; and further, that to preserve it well, it should be made perfectly dry; but when it is to be used as a perfume, it should be moistened.

PYROTHONIDE.

A French physician has lately introduced into the *Materia Medica* a substance produced by the combustion of linen, hemp, or cotton cloth, in the open air. He considers it useful in various inflammatory affections, especially in opthalmia, or diseases of the eye, and chilblains. To prepare pyrothonide, take a handful of cloth, old or new, place it in a shallow basin, set fire to it, moving it about, so that the basin does not become too hot; after the combustion is finished, throw out the ashes; at the bottom

* Jameson's Journal.
† Brande's Journal.
‡ Bull. Univ.
§ Brewster's Journal.

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of the vessel will be found a semi-aqueous, semi-oleaginous product, of a reddish brown colour, and possessing a pungent odour. Pour upon this five ounces of cold water, which will dissolve it entirely, forming the solution of pyrothonide, which is used in a more or less diluted state, as may be requisite, for collyria, fomentations, &c.*

THE FIRE KING.

In July last M. Chabert exhibited, at the Argyll Rooms, his extraordinary power of resisting the effects of poisons, either internally or externally. M. Chabert, it will be recollected, is the individual whose equally wonderful capability of withstanding heat has been shown by his remaining shut up in ovens during a long period, and under a degree of temperature far above that which would have destroyed any other living creature.†

Having armed himself by the antidote which he has found to be a guard against animal poisons, M. Chabert swallowed *forty grains of phosphorus*, in the presence of the astonished company. The phosphorus was distinctly put upon his tongue by a gentleman, and beyond all doubt fairly taken into the stomach: nearly, if not quite enough, we presume, to have killed all those who saw this feat done. His next exploit was to sup two spoonsful of oil, at 330° by the thermometer—*i. e.* 120° above the heat of boiling water. This he did without any apparent inconvenience; though the spoon remained for minutes so hot that no one could bear to touch it with his hand. Finally, M. Chabert held his head directly over and in the midst of the fumes of sulphuric acid, which diffusing over a large room speedily became too potent to be inhaled with impunity by any other being who was present.

As it may be asked, to what useful purpose can these astonishing proceedings contribute? we should state, that M. Chabert affirms his ability to save the lives of men from every species of poison; and that his antidotes, administered in adequate time after the poison has been swallowed, are as effectual as if previously taken. He further says, that he has *three* antidotes—one a preservative against vegetable, another against animal, and a third against mineral poisons; so that those of the whole kingdoms may be met and overcome. Even the fatal hydrocyanic, or prussic acid, he professes to take with safety; and from having withstood the bites of vipers and other venomous creatures, he is of opinion that his remedy would be a specific against the bite of mad dogs, and a cure for hydrophobia.‡

Upon this exhibition, Dr. John Gordon Smith,§ who was present, remarks, that

Phosphorus not being an animal substance, the application of an antidote to a poison derived from the animal kingdom in general, would have excited my suspicion as to Chabert's integrity at once; but I distinctly understood from him that he had prepared himself for that *individual* poison, which, in point of fact, he did swallow, and *for no other*. He

* Medical Journal.

† For an experiment of this description, see page 131 of the *Arcana of Science* for 1829.

‡ Literary Gazette. § Letter to the Lit. Gaz.

was not aware of the scrutiny to which he was to be subjected, or else (he told me) he would have been prepared to take any one of a variety of antidotes, in the event of some other poison having been selected. As it was, we were compelled to take him as we found him. I entirely agree with you, that he, *optimâ fide*, swallowed forty grains of phosphorus, which created no perceptible alteration in the state of his system, and which did not hinder him from eating as hearty a dinner as any one present. It may not be *quite* irrelevant to add, that during the exploit of taking the poison I stood close to him; and that during the whole of the evening (at dinner and afterwards) he sat next to me: of these facts you yourself were eye-witness. A vast deal of conversation consequently passed between us, which the company in general did not become privy to; and in this incipient stage of the business, I am satisfied that Chabert *is not an impostor*.

Subsequent to this exhibition an advertisement appeared in the *Times* newspaper, in which a Mr. J. Smith, after insinuating that M. Chabert practised some juggle when he appeared to enter into an oven heated to 500 degrees, and to swallow twenty grains of phosphorus, challenged him for any sum, to perform the exploits which he professed to be performing daily. To this challenge Mr. Smith appended an assurance, that if M. Chabert "fairly accomplished such an undertaking, he would likewise do the same." The Fire-King accepted the challenge, and the sum fixed was *50l.*, and the day September 23, at the Argyll Rooms. A little before three o'clock, the Fire-King appeared and impatience was soon manifested by the persons present to witness the exhibition, in consequence of the non-arrival of Mr. J. Smith. In the meantime Chabert amused the company with a few experiments, which he said any of them might perform with the greatest ease. He then made a shovel red-hot and rubbed it over his tongue, a trick for which no credit, he said, was due, as the moisture of the tongue was sufficient to prevent any injury arising from it. He next rubbed it over his hair and face, declaring that anybody might perform the same feat, by first washing themselves in a mixture of spirits of sulphur and of alum, which, by cauterizing the epidermis, hardened the skin to resist the fire. He next put his hands into some melted lead, took a small portion of it out, placed it in his mouth, and then gave it in a solid state, to some of the company. This performance, according to his account, was also very easy; for he seized only a very small particle, which, by a light compression between the finger and thumb, became cool before it reached the mouth.

At length the challenger arrived. A cruize of oil was produced, and poured into a saucepan, which was previously turned upside down, to show that there was no water in it. The alleged reason for this step was, that vulgar conjurors who profess to drink boiling oil, place the oil in water, and drink it when the water boils, at which time the oil is not warmer than an ordinary cup of tea. The oil was then heated, and the thermometer having proved it to be 360 degrees, the Fire-King drank off a spoonful.

Mr. Smith next produced some phosphorus, as did the Fire-King; both of the poisons were examined, and if any difference, that brought by M. Chabert was the strongest. Mr. Smith then decided that twenty grains was the quantity to be swallowed, which was accordingly weighed out for himself and his competitor, each portion being in a glass of water. The Fire-King swallowed his dose, and upon his mouth being examined, there was no phosphorus either upon or under his tongue. Mr. Smith,

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however, declined swallowing his quantum; he lost the wager, and confessed his object answered in seeing twenty grains of genuine phosphorus actually swallowed. The Fire-King next swallowed a small piece of a burning torch, and then withdrew into another room for the professed purpose of putting on his usual dress for entering the oven, but in all probability for the real purpose of getting the phosphorus, by some antidote, from his stomach. Zinc is the usual antidote for phosphorus; but Chabert says that it is not the antidote which he uses. It is said that some eminent physicians asked him, a few days previous, if he would object to the poison being taken off his stomach by the stomach-pump, and that he replied that he should have no objection, providing, that in analyzing the contents of his stomach, they would be satisfied with ascertaining the existence of the poison, and not seek to discover the nature of his antidote, which was so simple in its nature, that when it was once known, every apothecary's boy could provide it. He has repeatedly taken all the different poisons which were placed upon his teeth. On one occasion, when he was exhibiting before the Duke of Norfolk, he took a tea-spoonful of prussic acid; but that experiment he said he would never repeat; for it is a poison which not only requires the antidote to be taken first, but is also so rapid in its operation, that it may destroy life before the antidote can produce its effect. He said that he should never forget his feelings as soon as he had swallowed it. Every vein in his head appeared to swell, and "each particular hair," he said, "stood erect, like quills upon the porcupine."

After an absence of twenty minutes, M. Chabert returned, dressed in a coarse woollen coat, to enter the heated oven. Before he entered it, a medical gentleman ascertained that his pulse was vibrating ninety-eight times in a minute. He remained in the oven for five minutes, during which time he sung "*Le Vaillant Troubadour*," and cooked two dishes of beefsteaks. At the end of that time he came out, perspiring profusely, and with a pulse making 168 vibrations in a minute. The thermometer, when brought out of the oven, stood at 380 degrees; within the oven he said it was above 600. He had never been exposed to such intense heat before.*

After these explicit testimonials, we can hardly be sceptical enough to doubt the fact of the performances. Still, the following report, abridged from an equally respectable contemporary,† will shake the faith of many persons:

When he last exhibited himself at White Conduit House, we stated the contrivances by which he made the spectators believe in the reality of his feats. For instance, he professed to remain in an oven heated to a degree sufficient to corrugate, or even cook, a beefsteak. We acted the Paul Pry upon this occasion; and, by peeping through a fissure in the oven, detected the trick. The mass of burning embers, by which the oven had been heated, was not, as he pretended, fairly swept out. Those that were well ignited were acervated (heaped up) into one corner; and the steak, so far from being left to the action of the heated air of the oven, was put between two tin dishes, and was embedded in the mass of the burning embers in the corners. We need not say that it was cooked, and well cooked, in a very short time. Again, we gave M. Chabert his own thermometer, desiring him to hold it in the middle of the oven, or even against the wall, in order to ascertain the mean temperature. This he

* Abridged from the *Times*. † The *Morning Chronicle*—Oct.

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professed to do, although we saw him thrust the bulb of the thermometer into the embers, and when he returned it to us, the scale was discoloured by the fire, and had some of the embers sticking to it. By this fraud he made the spectators believe that he was breathing an atmosphere heated to nearly 600 degrees—a heat that would have fused platina. M. Chabert, in swallowing the phosphorus, washed it down with what he asserted was pure water. We took the liberty of tasting it, and found it saturated with alkali.

Then came the experiments of the boiling lead. A gentleman in the room, who seemed to eye things with great acuteness, requested the Fire-King to merge the bulb of the thermometer into the liquid metal. This he refused, on the plea that it would break the thermometer. No thermometer will break while the tube permits the mercury to rise. This thermometer was graduated, we believe, to 680 degrees, which would admit of the melting of any metal; and it was submitted to M. Chabert whether he ought to place the value of a thermometer in competition with convincing the audience of the integrity of the experiment. The test, however, was refused. Lead melts at 594 degrees; mixed with tin and bismuth, it will melt at 200 deg.—what a range for fraud in this feat!

Then came the experiment of swallowing the boiling oil. The thermometer rose no higher than 320, although we know that oil will not boil at less than 600 degrees. We cannot say whether ether or what was mixed with it, but it contained a strong brown sediment. Oil parts with its caloric, or, in other terms, gets cold very rapidly; and between the taking the thermometer out of the oil and putting the oil into the mouth, time elapsed sufficient to cool the oil considerably. We did not see a single drop go down M. Chabert's throat: he merely let it run off his tongue on the floor.

Our anxiety to give the facts as stated by the above parties, so as to induce the reader's comparison and consideration, will explain the length of this paper.

HYDROCYANIC PRUSSIC ACID.

M. Orfila, the celebrated French chemist, has recently been making a series of experiments with hydrocyanic acid, chiefly for the purpose of ascertaining the proper means of restoring a person to life, where it is practicable, after taking this poison. Hitherto the remedies prescribed have been strong infusions of coffee and oil of turpentine; but seldom with good effect. M. Orfila recommends, first, an emetic; second, the application of ammoniacal or chlorurated water to the nostrils, bleeding from the arm, and the application of leeches behind the ears; third, the affusion of cold water, in the way prescribed by a German physician, M. Erbot. M. Orfila states that these means will restore the patient, unless the quantity of prussic acid taken has been very great. In order to ascertain the presence of this poison, he recommends the use of nitrate of silver, by which the acid will be precipitated in the form of cyanure of silver. In case of poisoning by opium, he recommends, previous to the administration of emetics, a strong decoction of nutgalls, for the purpose of decomposing the opium.

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NATURAL HISTORY:

ZOOLOGY, BOTANY, MINERALOGY, GEOLOGY, METEOROLOGY, &c. &c.

DURATION OF HUMAN LIFE IN COUNTIES OF ENGLAND AND WALES.

Abridged from Dr. Hawkins' "Elements of Medical Statistics."

IN 1780, the annual mortality of England and Wales was 1 in 40. By the last census (of 1821,) the yearly mortality had fallen to 1 in 58, nearly one-third. The rate of mortality is of course not equal throughout the country. According to Dr. Hawkins, this is mainly influenced by the proportion of large towns which any district or county contains. The lowest well-ascertained rate of mortality in any part of Europe is that of Pembrokeshire and Anglesey, in Wales, where only one death takes place annually out of eighty-three individuals. Sussex enjoys the lowest rate of mortality of any English county; it is there 1 in 72. Middlesex, on the other hand, affords the other extreme, 1 in 47; yet here, where the rate of mortality is higher than in any part of England, great improvements in the mean duration of life are taking place; for in 1811, the mortality was as great as 1 in 36. Kent, Surrey, Lancashire, Warwickshire, and Cheshire, are the counties where, next to Middlesex, the deaths are most numerous. The three last named counties enjoy many natural advantages, but these are more than counterbalanced by the number and density of their manufacturing towns. It is a circumstance well worthy of note, that the aguish counties of England do not, as might have been expected, stand high in the list. In Lincolnshire, the rate of mortality is only 1 in 62. Dr. Hawkins hesitates whether to attribute this to the large proportion of dry and elevated district which that county possesses, or to the exemption of fenny countries generally from consumption. We are strongly inclined to suspect that the latter is the true explanation of the fact. The notion was originally thrown out by the late ingenious physician, Dr. Wells, who even went so far as to advise the removal of consumptive patients to the heart of the Cambridgeshire fens, rather than to Hastings or Sidmouth.

The author goes on to remark, "the decline in the mortality

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is even more striking in our cities than in our rural districts. While the metropolis has extended itself in all directions, and multiplied its inhabitants to an enormous amount,—in other words, while the seeming sources of its unhealthiness have been largely augmented, it is actually become more friendly to health." In the middle of the last century, the annual mortality was about 1 in 20. By the census of 1821, it appeared as 1 in 40: so that in the space of seventy years, the chances of existence are exactly doubled in London,—a progress and final result, adds the author, without a parallel in the history of any other age or country. The high rate of mortality in London about the year 1750, exceeding considerably that of former years, has been attributed to the great abuse of spirituous liquors, which were then sold without the very necessary check of high duties. One of the results of these statistical investigations which, *a priori*, we should least have been prepared for, is the uncommon healthiness of Manchester. The rate of mortality there at the present time does not appear to exceed 1 in 74.

The statistics of the sexes affords some curious results. The relative numbers of the sexes are the same in all parts of the world—namely, at birth, twenty-one males to twenty females, but as the mortality among males during infancy exceeds that of females, the sexes at the age of fifteen are nearly equal. A late French writer, M. Giron, thinks himself warranted in the opinion that agricultural pursuits favour an increase in the male, while commerce and manufactures encourage the female population. There exists throughout the world considerable variety in the proportion of births to marriages, but, upon an average, we may state it at about four to one. It has been uniformly found, however, that improvements in the public health are attended by a *dimunition* of marriages and births. The great principle is this: as the number of men cannot exceed their means of subsistence, *if men live longer, a less number is born*, and the human race is maintained at its due complement with fewer deaths and fewer births, a contingency favourable in every respect to happiness. The author illustrates this very important principle by the population returns both of England and France.*

HABITS OF THE EGYPTIAN SCARABÆUS.

(From the Notes of a Traveller in the Lybian Desert.)

"OCTOBER 12th. Being on watch this night, I caught, for the first time, the *Scarabæus ateuchus sacer*, or chafer, with which the imaginations of the ancient Egyptians so frequently busied themselves. My attention was attracted by a noise close to my side, and athwart the darkness I discovered a large rolling ball. Conceiving it to be a crab or land tortoise, I took it into my

* Review of Dr. Hawkins' Work, in Brande's Journal.

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hand, but found it to be nothing but a lump of horse-dung, and immediately afterwards I perceived a similar ball come rolling towards me. Upon holding my lantern down and minutely examining this strange machine, I found that it concealed a large black chafer, who drove it forwards by means of his long hind legs; and as it proceeded it gradually increased in size by the continual accumulation of sand; this indeed became so considerable at last, that the insect itself was scarcely perceptible. It is more than probable, that the Egyptian priests took advantage of this deception to mystify their followers, and that their veneration for the chafer, or scarabæus, arose from that circumstance. Upon a further examination, with the aid of my lantern, I discovered several animated balls of a like description more than three inches in diameter. My Arabian companions, however, did not appear to take notice of them."

VEGETATING WASP OF GUADALOUPE.

BOTANISTS and entomologists know that particular productions which have been recognised as cryptogamous plants, many of which have been referred to the genus Sphæria, are frequently met with on dead insects, and are preserved in collections; but it has been thought that these plants developed themselves on insects deprived of life. M. Ricord, however, states, that he has observed at Guadaloupe a nest of wasps, the greatest number of which were encumbered with these excrescences. As they quitted the nest, they fell upon the ground, and could not rise again on account of the weight of the plant, which had taken root on some part or other of their body, particularly on the breast-bone. Having observed the larvæ contained in the cells, M. Ricord remarked, that they also had this small cryptogamous appendage, but then it was very small. This species appears to be the *Sphæria entomorbiosa* of the English botanists.*

INGENUITY OF A BEAVER AT PARIS.

A BEAVER from the Rhine is now, or was lately, in the royal collection in the Jardin des Plantes at Paris, which exhibited as much ingenuity as has ever been ascribed to the species in a wild state, and more than enough to silence the incredulity of sceptics respecting the beavers' dams, and their magazines of winter provisions. This beaver, for instance, we are informed by M. Geoffroi St. Hilaire, was, during the severe weather in winter, furnished with fresh twigs of trees, to give exercise to his propensity to gnawing, and with apples, &c., as a more nutritive food. One night there came on a snow storm, and the snow beat into his domicile in considerable quantity, till he found out

* Journ. du Pharm.

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a plan of shielding himself from the inconvenience. For this purpose, he cut his supply of twigs into proper lengths, to be wove in the basket fashion, between the bars of his cage; chopped his apples in pieces, to fill up the intervals between the twigs; and, when even this did not appear sufficiently air-tight, or (if you will) storm-tight, he kneaded the snow into the intervals. By the morning it appeared that he had laboured hard all night, and had completed a very neat and ingenious barricado against the intrusion of the snow.*

MUSICAL SNAILS.

As I was sitting in my room, on the first floor, about nine P.M. (4th of October last,) I was surprised with what I supposed to be the notes of a bird, under or upon the sill of the window. My impression was, that they somewhat resembled the notes of the wild duck in its nocturnal flight, and, at times, the twitter of a red-breast, in quick succession. To be satisfied on the subject, I carefully removed the shutter, and to my surprise found it was a garden snail, which, in drawing itself along the glass, had produced sounds similar to those elicited from the musical glasses.†

FOOT OF A CHINESE FEMALE.

On March 5, a paper was read, entitled, "Anatomical description of the foot of a Chinese female." By Bransby Blake Cooper, Esq.; was communicated to the Royal Society, by P. M. Roget, M.D. Sec. R.S.

The foot, of which an account is here given, was obtained from the dead body of a female found floating in the river at Canton, and had all the characters of deformity consequent upon the prevailing habit of early bandaging for the purpose of checking its natural growth. To an unpractised eye it has more the appearance of a congenital malformation, than of being the effect of art, however long continued; and appears at first sight like a club foot, or an unreduced dislocation. From the heel to the great toe, the length of the foot, measures only four inches; the great toe is bent abruptly backwards, and its extremity pointed directly upwards; while the phalanges of the other toes are doubled-in beneath the sole of the foot, having scarcely any breadth across the foot where it is naturally broadest. The heel, instead of projecting backwards, descends in a straight line from the bones of the leg, and imparts a singular appearance to the foot, as if it were kept in a state of permanent extension. From the doubling-in of the toes into the sole of the foot, the external edge of the foot is formed in a great measure by the extremities of the metatarsal bones; and a deep cleft or hollow appears in

* Athenæum. † Correspondent—Mag.. Nat. Hist.

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the sole across its whole breadth. The author gives a minute anatomical description of all these parts, pointing out the deviations from the natural conformation. He remarks, that from the diminutive size of the foot, the height of the instep, the deficiency of breadth, and the density of the cellular texture, all attempts to walk with so deformed a foot must be extremely awkward; and that in order to preserve an equilibrium in an erect position, the body must necessarily be bent forwards with a painful effort, and with a very considerable exertion of muscular power.*

THE CUCKOO.

Mr. Jerdan, editor of the *Literary Gazette*, in a letter to Mr. Loudon, says, I beg to inform you that about fifteen years ago I obtained a cuckoo from the nest of (I think) a hedge sparrow, at Old Brompton, where I then resided. It was rather curious, as being within ten yards of my house, Cromwell Cottage, and in a narrow and much frequented lane, leading from near Gloucester Lodge to Kensington. This bird I reared and kept alive till late in January; when it fell suddenly from its perch, while feeding on a rather large dew worm. It was buried: but I had, long afterwards, strange misgivings, that my poor feathered favourite was only choked by his food, or in a fit of some kind—his apparent death was so extremely unexpected from his health and liveliness at the time. I assure you that I regretted my loss much, my bird being in full plumage and a very handsome creature. He was quite tame, for in autumn I used to set him on a branch of a tree in the garden, while I dug worms for him to dine upon, and he never attempted more than a short friendly flight. During the coldest weather, and it was rather a sharp winter, my only precaution was, nearly to cover the cage with flannel; and when I used to take it off, more or less, on coming into my breakfast room in the morning, I was recognised by him with certainly not all the cry "unpleasant to a married ear," but with its full half "*Cuck! Cuck!*"—the only sounds or notes I ever heard from my bird. Though trifling, these facts may be so far curious as illustrating the natural history of a remarkable genus, and I have great pleasure in offering them for your excellent Journal.†

The Continental naturalists have raised a controversy respecting the species of the common cuckoo, which is found to vary considerably in the colour of its plumage, one being thence called the red and another the grey cuckoo; the former supposed to be the *Cùculus hepáticus* of Latham, and the latter the *C. canòrus* of Linnæus. M. Payrandeau, however, states distinctly, on the authority of a series of specimens, as well as of repeated dissection, that both the male and female young of the *Cùculus*

* Phil. Mag. † Mag. Nat. Hist.

canorus, before the first moult, have the same colour: that, after the first moult, the males have a deep olive ash colour, and the red spots have already begun to disappear; in the females, on the contrary, the red spots become brighter and larger: that, at the third moult, the red spots on the male disappear altogether, while in the female they continue to the most advanced age, when it puts on the plumage of an old male, of which change M. Payrandeau possesses a specimen. M. Temminck, again, whose authority is very high, regards the red cuckoo as the young of the grey cuckoo of one year old; but Vieillot, the father of the French ornithologists, as well as Meyer, Jules, Delamothe, and Baillon of Abbeville, agree with M. Payrandeau.*

NEW SPECIES OF TAPIR.

Mr. G. Cuvier lately made a report to the Academy of Sciences of France, on the memoir of Dr. Roulin, having for its object the natural history of the tapir, and particularly that of a new species of that genus, which the author has discovered in the high regions of the Cordilleras of the Andes. The new tapir, according to Cuvier, has a much greater resemblance to the Palæotherium, than to any of the two species formerly known. The memoir, besides having added to the catalogue of animals a large quadruped, belonging to a genus, which for a long time contained but a single species, throws light upon a fact which relates to the history of the antediluvian animals; for it had even been advanced by some authors, that a genus of these animals, the Mastodon, probably still exists in the higher valleys of the Cordilleras.†

GOATS OF THIBET.

The project of introducing the breed of goats of Cashmere into Germany, has not been very favourably entertained. One writer has pretended to show that the European goat, by a single cross, might be brought to yield the precious article for which so much money is sent into Asia. Another argues against the Asiatic animal, on the ground that a single sheep of a good breed will bring four times the profits of a goat of Thibet; and a third, M. Schmidt, rejects their introduction into Germany, because France has anticipated that country in the manufacture of the merchandize in which their down is used. M. Schmidt makes the following observations on the fleece of these animals. Judging by their fleece, there are, he says, two sorts of goats; one which may be called the race of Angora, with hair long and pendent; the other, the goat of Thibet, with hair short and stiff. The former has no down; the latter, on the contrary, is covered, during winter, with a down which is more abundant and finer in those

* Bull. des Sciences. † Edin. Journ. Nat. and Geo. Sciences.

kept on the mountains. These two races, originally from Asia, have produced by their mixture, aided by the influence of climate, many varieties. On examining with attention the European goat, it will be found also that the long-haired ones have no down; or, if they have any, it is in very small quantities along the vertebral column; while of those which have short hair, there are to be found some which have a down spread over the entire carcass. This down grows almost to the length of hair in the spring; then comes off, and appears on the surface, to which it gives a grey tint. By the mixture of these breeds a bastard race is formed, which have more or less down; but it is observed that the offspring partook more of the nature of the dam than of the sire. The two principal importations of the goats of Asia into Germany are those of M. Wallner of Geneva, who procured them directly from Thibet; and of M. Lowenherz, who received them from M. Terneaux; so that the former are goats of Thibet, the latter Kirguises. The emperor of Austria, the kings of Bavaria and Wurtemberg, all the archdukes, and some private individuals, have procured goats of the former importation. They have been introduced into Saxony by M. de Buest, on his domain of Tossfell.*

BREEDING OF LEECHES.

M. Mehrer of Maulbronn, by turning his attention to the care of leeches, has succeeded in introducing the breed of those Mollusca into Wurtemberg, and in producing them in such quantities as to dispense with all importation from abroad. He received a premium of twenty ducats and a silver medal as a reward for his efforts.†

ON MANTES, OR LEAF INSECTS.

By Dr. Adam.

Of all the insect tribes in India that of the leaf insects is the most remarkable for external form. According to the latest classification, this tribe has been divided into the two families of the *Mantida* and *Phasmida*, founded on a difference in the structure of the foot or leg; this member in the former being raptorious, is provided with a sharp claw, and a hollow on the leg and thigh, and a double series of spurs, for the better securing its prey; and in the latter, being destitute of any such peculiarity. Dr. Adam calls two of the specimens laid before the committee *Gongylodes*, as they appear to correspond closely with the description and figure of that species in the latest entomological works. This insect, when alive and fresh, presents a striking resemblance to a blade of grass, differing in colour according to the season, being green and succulent in the rains, and in dry wea-

* Bull. des Sciences Nat. † Allg. Lit. Zeit.

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ther, so much like a withered straw, that they can with difficulty be distinguished. On first beholding this insect, during the hot winds in the upper provinces, Dr. Adam could hardly be convinced that it was not straw, and part of the same long and dry grass on which it rested. A slight movement of the head, however, like that of the house lizard, on the wall, when watching its prey, satisfied him that it was a living object, and on removing grass and all to his hut for examination, he was both surprised and amused at the extraordinary powers which the insect developed. Clinging close to the upright straw which was fixed on the table, the animal lay in wait for its prey, with no less design than would be exhibited by a cat or tiger, and if an unlucky fly happened to alight in his neighbourhood, there was hardly left to it a chance of escape. He projects rapidly his armed paw, and, with unerring aim transfixing his victim, lodges it in the toothed hollow of the thigh, destined for its reception. After the fly is in his power, no time is lost in devouring it, commencing with the trunk, and in a few minutes swallowing the whole, the head and wings constituting the finishing morsel. In this manner he would destroy at a meal five or six large flies, which, in point of bulk, nearly doubled his own body.

On viewing the structure of the fore-limb of this insect it seems impossible to imagine any thing more perfectly contrived for the end in view. The limb itself so strong and muscular, provided with a claw at its extremity, likewise strong, horny, and sharp as a needle, and the groove in the last joints, with the double row of teeth or spurs on the margin, corresponding, and locking closely into each other, like the fangs of the alligator, altogether constitute an apparatus for seizing and securing its prey, which, in so small a creature, cannot but excite admiration. By means of these formidable weapons, the insect not only becomes destructive to others, but is employed to attack its own species; and in China, we are told, fighting the mantis forms as much the favourite amusement of boys, who carry them about in cages for the purpose, as cock-fighting in England, or among the inhabitants of the Eastern Islands.*

CHANGES IN ANIMALS.

All domestic mammiferous animals introduced into America, have become more numerous than the indigenous animals. The hog multiplies very rapidly, and assumes much of the character of the wild boar. Cows did not at first thrive, but in St. Domingo, only twenty-seven years after its discovery, 4,000 in a herd was not uncommon, and some herds of 8,000 are mentioned. In 1587, this island exported 35,444 hides, and New Grenada 64,350. Cows never thrive nor multiply where salt is wanting

* Trans. Asiatic Society of Calcutta.

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either in the plants or the water. They give less milk in America, and do not give milk at all if the calves be taken from them. Among horses the colts have all the amble, as those in Europe have the trot: this is probably a hereditary effect. Bright chestnut is the prevailing colour among the wild horses. The lambs which are not from *merinos*, but the *tana basta* and *burda* of the Spaniards, at first are covered with wool, and when this is timely shorn, it grows again; if the proper time is allowed to elapse, the wool falls off, and is succeeded by short, shining, close hair, like that of the goat in the same climate. Every animal, it would appear, like man, requires time to accustom itself to climate.*

WILD PIGEONS IN NORTH AMERICA.

We have never before witnessed such multitudes of wild pigeons, as have appeared amongst us (Montrose) at the present season. Flocks extending miles in length have many days been seen passing over the hills and presenting a novel and interesting appearance. But what is most extraordinary, and causes us now to notice them, is their encampment about ten miles from this place, in a south-west direction, where they have built their nests and are raising their young. This encampment is upwards of nine miles in length, and four in breadth; the lines regular and straight; within which there is scarcely a tree, large or small, that is not covered with nests. They cause such a constant roaring by the flapping of their wings, that persons on going into the encampment have great difficulty in hearing each other speak. Every thing throughout their camp appears to be conducted in the most perfect order. They take their turns regularly in sitting and feeding their young, and when any of them are killed upon their nests by the sportsmen, others immediately supply their place. We are inclined to believe, that they have in part adopted Mr. Owen's community system, as the whole appears to be a common stock business. The *squabs* (as the young are called) are now sufficiently large to be considered by epicures better for a rich dish than the old ones, and they are caught and carried off by wagon loads.†

ON THE SEXUAL INSTINCT OF INSECTS.

By J. H. Davies.

It has been asserted, that the circuitous flight of the butterfly tribe arises from one sex pursuing through the air the track of the other; and that, if an unimpregnated female of the *Phalæna quercus* (egger moth) be carried in a gauze cage into the haunts of that species, numbers of the males will be attracted, so as to be easily captured. I have never had an opportunity of verifying

* From the French.

† Susquehanna County Register.

this fact; but, from a circumstance which occurred to me during the past year, I have no doubt of its correctness.

I was engaged in rearing lepidopterous insects from the larvæ, and had a great variety of the pupæ of different species. One evening, I found a female *Sphinx ocellata* just emerged, which, in lifting from the floor, ran up my arm and round the collar of my coat: two hours after, on returning to my study from shutting some glass frames in the garden, a very fine male of the same species was fluttering on my shoulder, where the female had previously crawled. But a still more curious fact, which must appear almost incredible, remains to be stated. Two females of the sphinx populi were evolved. The next day I found three males in the room. As no one had entered it in the interval, nor was there apparently any mode by which they could gain access, I was somewhat puzzled to account for their appearance. The same evening, however, the mode of entrance was made apparent, by two more males, of the same species, coming down the chimney; one of which fell into a vase standing on the fireplace, where I captured it before it could extricate itself. Afterwards, upon occasion of the evolution from the pupa state of females of the *Phalæna bucephala* and *Phalæna salicis*, the windows of my study were completely besieged by males of the same species, which, upon throwing open the windows, eagerly rushed in.*

AMERICAN SEA-SERPENT.

Mr. Samuel Mitchell has, in his "Summary of the Progress of Natural Science for the last few Years," given an amusing account of the progress of sea-serpentism. It was read before the New York Lyceum, and is inserted in the American Journal of Science, although not thought conclusive by its learned editor, Dr. Silliman. The first sea-serpent was a steam-boat, which, being established at Boston to coast along the shore, and from its powers and capabilities competent to injure the business of small boats, was described as a sea-serpent that had been seen off Nahant and Gloucester, and had probably come there to consume all the small fish in the place. This was received by many as a serious account, and believed accordingly.

Another sea-serpent history arose from the circumstance, that a small sloop, called the Sea-serpent, having been passed by another vessel, the captain of the latter, when asked, upon his arrival at home, for news, said he had seen a sea-serpent, and then described its bunches on the back, the action of its tail, and other parts; all of which being understood literally, actually appeared in print, as evidence for the existence of the animal.

Then a piece of the skin of the bony scaled pike was taken for

* Brande's Journal.

part of a sea-serpent's hide. A speckled mother duck, with a numerous brood of young ones swimming after her in a line on Lake Ontario, was described as the serpent itself. And from such occurrences as these, perhaps, mingled with careless observation of the motions and appearances of porpuses, basking sharks, and balænopterous whales, appear to have originated every thing that has been said about American sea-serpents.*

VESSEL MADE OF THE PAPYRUS.

By John Hogg, Esq., M.A. F.L.S., &c.

THE papyrus, paper reed, or Egyptian reed, the *Cypèrus Papyrus* of Linnæus, or *Papyrus antiquòrum* of Sprengel, is a plant so well known, that it will be superfluous to add here any detailed account of it.

We find mention of ships, and boats or canoes, being made of the *Papyrus* in Exodus, Job, Isaiah, Herodotus, Theophrastus, Diodorus Siculus, Strabo, Lucan, Pliny, and Plutarch, among the ancient writers; and by some modern authors, as Shaw, Bruce, &c.

Theophrastus says, that, in Egypt, "they make boats of the papyrus, and weave both sails and ropes of the bark."

Pliny states the same; "of the papyrus itself they make sailing vessels; and of its bark, sails and cables." Again, he mentions "papyrine ships and equipments of the Nile;" and, in another place, he speaks more distinctly of their Egyptian origin, as, "ships were first invented from papyrus in the Nile in Egypt."

But Herodotus has given a good account of the ships of burthen, called *baris* (*See the Cut,*) which were commonly used on the Nile; and he thus describes the ancient Egyptian method of building them: — "Cutting planks from the thorn tree (most probably the Mimòsa nilótica *Lin.*) about two cubits large, they place them together in the form of bricks, building the vessel after this manner: they bind these planks of two cubits around thick and long stakes; when they have thus put them together, they place benches upon them: they never make use of carved ribs; but they fill up the joints

* Brande's Journal.

on the inside with papyrus. They make one rudder, which passes through the keel; and they have a mast formed of the thorn tree, and sails of the paper reed."

Of our modern travellers in Africa, Bruce observes:—"Pliny says that the whole plant together was used for making boats, a piece of the acacia tree being put in the bottom to serve as a keel; to which plants were joined, being first sewed together, then gathered up at stem and stern, and the ends of the plant tied fast there; and this is the only boat they still have in Abyssinia." *

THE COCHINEAL INSECT.

Some of these insects have lately been sent over to old Spain, and are doing remarkably well on the prickly pear of that country: indeed, they are said to rival even those of Mexico in the quality and brilliancy of their dye. Their naturalization may doubtless be extended along the shores of the Mediterranean, Sicily, and the different states of Greece. The prickly pear is indigenous in those places, and by little cultivation will afford sufficient nourishment for the cochineal insects. We are also assured (says an intelligent correspondent of *The Times*) that these precious insects were introduced last year on the island of Malta, by Dr. Gorman, on account of the Government, and that they are likely to do well on that island.

Dr. Gorman, in the spring of last year, discovered in the botanic garden at Cambridge, the *grona sylvestris*, or wild species of cochineal, living among the leaves of the coffee-plants, acacia, &c. This is the kermes, or gronilla of Spain, about which so much has been said in endeavouring to identify it with the grona fina. At all events, this is the same species as the gronilla found on the hairs of the green oaks in Andalusia; and in some years large and valuable crops of the gronilla are gathered in that part of Spain by the peasantry, and sold to the Moors, to dye their scarlet.

The gardener at Cambridge could not inform Dr. Gorman how long the insects had been there, or from whence they came, but they went there by the appellation of "amelca bug." The gardener found these insects very destructive to plants upon which they fostered; and although he tried every means short of injuring the plants to remove them, he found it impossible, as they adhere to the leaves and parts of the stem with such tenacity, and are so prolific, that the young ones are often found spreading themselves over the neighbouring plants. On this account, it would be worth while to attempt the cultivation of the prickly pear in the open air in this country, and place the insects upon them, for in all probability the insects would, by good management, do well.†

* Abridged from the Mag. Nat. Hist. † Mirror.

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THE GIRAFFE.

The King's Giraffe died in October, at the Menagerie at Sandpit-gate, near Windsor. It was nearly four years and a half old, and arrived in England in August, 1827, as a present from the Pacha of Egypt to his Majesty.

About the same time another giraffe arrived at Marseilles, being also a present from the Pacha to the King of France. This and the deceased animal were females, and were taken very young by some Arabs, who fed them with milk. The Governor of Sennaar, a large town of Nubia, obtained them from the Arabs, and forwarded them to the Pacha of Egypt. This ruler determined on presenting them to the Kings of England and France: and as there was a difference in size, the Consuls of each nation drew lots for them. The shortest and weakest fell to the lot of England. The giraffe destined for our Sovereign was conveyed to Malta, under the charge of two Arabs; and was from thence forwarded to London, in the *Penelope* merchant vessel, and arrived on the 11th of August. The animal was conveyed to Windsor two days after, in a spacious caravan. The following were its dimensions, as measured shortly after its arrival at Windsor:—

	Feet.	Inches.
From the top of the head to the bottom of the hoof	10	8
Length of the head - - - - - - -	1	9
From the top of the head to the neck-root -	4	0
From the neck-root to the elbow - - - -	2	3
From the elbow to the upper part of the knee -	1	8
From the upper part of the knee to the fetlock joint - - - - - - - - -	1	11
From the fetlock joint to the bottom of the hoof	0	10
Length of the back - - - - - - -	3	1
From the croup to the bottom of the hoof - -	5	8
From the hock to the bottom of the hoof - -	2	9
Length of the hoof - - - - - - -	0	7½

From the period of its arrival to June last, the animal grew eighteen inches. Her usual food was barley, oats, split beans, and ash-leaves: she drank milk. Her health was not good; her joints appeared to *shoot over*, and she was very weak and crippled. She was occasionally led for exercise round her paddock, when she was well enough, but she was seldom on her legs: indeed, so great was the weakness of her fore legs for some time previous to her death, that a pully was constructed, being suspended from the ceiling of her hovel, and fastened round her body, so as to raise her on her legs without any exertion on her part. When she first arrived she was exceedingly playful, and up to her death continued perfectly harmless.*

* Abridged from the Library of Entertaining Knowledge.

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INDIGO.

This valuable plant, which gives rise to as great speculation in India, as hops in England, is much injured by wet weather; although the rapidity of the growth of plants during much rain, in the temperature of the tropics, is extraordinary, yet a proportionable deficiency in all that characterizes the vegetable world necessarily follows. This we find to be the case with all forced vegetables; and the mildness of the radish of hastened growth, when contrasted with the highly pungent and almost acrid flavour of the slowly and gradually advanced one, may be adduced as explanatory of this observation. Hence, it is practically well known to manufacturers, that the indigo plant, however fine and luxuriant, as is the natural result of much rain, is very deficient in *produce*, and a similar loss is experienced even if the plant, without the fall of too much rain, has grown up under cloudy weather. Sunshine, much and continued sunshine, is essentially necessary for the proper exercise of those secretory organs by which this peculiar drug is formed and perfected.

Indigo leaves produce two dies—blue and yellow; but the refuse leaves, when boiled for an hour and a half, will render the water yellow, tinged with green. This water, kept boiling for two hours (supplying the loss by evaporation), will, when filtered, afford a precipitate, which, when dried, will in colour be a dun-slate, and in quantity perhaps about equal to the blue extract such leaves have produced. This observation, as it can lead to no practical advantage, is made for the man of science, rather than the man of business.*

THE JOHN DORY.

Sir Joseph Banks's observation, that the name of this fish should be spelled and acknowledged "adorée," because it is the most valuable (or worshipful) of fish, as requiring no sauce, is equally absurd and unwarranted; for so far from its being incapable of improvement from such adjuncts, its relish is materially augmented by any one of the three most usual side tureens. The dory attains its fullest growth in the Adriatic, and is a favourite dish in Venice, where, as in all the Italian ports of the Mediterranean, it is called Janitore, or the gate-keeper, by which title St. Peter is most commonly designated among the Catholics, as being the reputed keeper of the keys of heaven. In this respect, the name tallies with the superstitious legend of this being the fish out of whose mouth the Apostle took the tribute money. The breast of the animal is very much flattened, as if it had been compressed; but, unfortunately for the credit of the monks, this feature is exhibited in equally strong lineaments by, at least, twenty other varieties of the finny tribe.

* Correspondent—Brande's Journal.

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Our sailors naturally substituted the name of John Dory for the Italian Janitore; and a very high price is sometimes given for this fish when in prime condition, as I can testify from experience, having two years since seen one at Ramsgate which was sold, early in the day for eighteen shillings.*

DESTRUCTIVE MOTH.

THIS moth (*see the Cut*) is found in July, as Mr. Samouelle states, in St. James's Park, against trees. We would strongly recommend, to gardeners in general, a closer examination of the stems of their fruit trees, by which many young trees might be saved, and much information accrue to entomologists in that particular branch of the science.†

THE SHIP WORM.

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THE *Terèdo navàlis*‡ (*see the Cut*) or ship-worm, is the only one which has excited notice by its destructive powers. This shell-enclosed worm, which Linnæus has emphatically, yet not undeservedly, styled the *calamitas navium*, is said to have been introduced into our seas from the East within little more than a century. They are now common in all the seas of Europe; and being gifted with the power of perforating wood, they have done, and continue to do, extensive mischief to ships, piers, and all submarine wooden buildings. The soundest and hardest oak cannot resist them; but, in the course of four or five years, they will so drill it, as to render its removal necessary, as has happened in the dock-yard of Plymouth. In the years 1731 and 1732, the United Provinces were under a dreadful alarm, for it was discovered that these worms had made such depredations on the piles which support the banks of Zealand, as to threaten them with total destruction, and to claim from man what he had wrested from the ocean. Fortunately they, a few years after totally abandoned that island, from causes

* Mirror. † Correspond.—Mag. Nat. Hist.

‡ For an account of these destructive insects, and a specimen exhibited to the Portsmouth Philosophical Society, see *Arcana of Science* for 1828, page 99.

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unknown, but suspected to be "from their not being able to live in that latitude when the winter was rather severer than usual." But still they might return; and so a prize of value was offered to any one who should discover a remedy against their attacks. What answer was returned I am ignorant; but the method now adopted to preserve the timbers necessarily used about the docks at Plymouth is, to cover that part which is continually under water with short broad-headed nails, which, in salt water, soon cover every part with a strong coating of rust, impenetrable to these animals.*

BEES' NESTS.

A French Journal says, in the woods of Brazil is frequently found hanging from branches the nest of a species of bee, formed of clay, and about two feet in diameter. It is more probable that these nests belong to some species of wasp, many of which construct hanging nests. One sort of these is very common in the northern parts of Britain, though it is not often found south of Yorkshire.

ON THE WATER OF THE MEDITERRANEAN.

By the late Dr. W. H. Wollaston, V.P.R.S.

The late Dr. Marcet, in his examination of sea-water, of which he has given an account in the Philosophical Transactions for 1819, had been unable, for want of a sufficient number of specimens of water taken at various depths in the Mediterranean, to draw any certain inference as to what becomes of the vast amount of salt brought into that sea by the constant current which sets in from the Atlantic through the Straits of Gibraltar, and which, on the evaporation of the water, must either remain in the basin of the Mediterranean, or escape by some hitherto unexplained means. In the hope of obtaining further evidence on this question, he had requested Captain Smyth, R.N., who was engaged in a survey of that sea, to procure specimens of water from the greatest accessible depths. The specimens collected by Captain Smyth were, in consequence of Dr. Marcet's death, given to other persons and applied to other objects. Dr. Wollaston, however, fortunately obtained the three remaining bottles of the collection. The contents of one of these, taken up at about fifty miles within the Straits, and from a depth of 670 fathoms, was found to have a density exceeding that of distilled water by more than four times the usual excess: and accordingly it left upon evaporation more than four times the usual quantity of saline residuum. The result of the examination of this specimen accords completely with the anticipation that a counter-current of denser water might exist at great depths in the neighbourhood of the

* Correspondent—Mag. Nat. History.

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Straits, capable of carrying westward into the Atlantic as much salt as enters into the Mediterranean with the eastern current near the surface. If the two currents were of equal breadth and depth, the velocity of the lower current need only be one-fourth of that of the upper current, in order to prevent any increase of saltness in the Mediterranean.*

HICCOUGH.

On the 3rd August, last, Mr. Daniel addressed to the Edinburgh Academy a letter on the hiccough. In the memoir, the author mentions the following experiment:—Let a dog fast eight or ten hours, place the animal on its back, and pour cold water on its stomach, and hiccough will be immediately produced; out of twenty-three dogs, the hiccough was excited in twenty-two; the same effects were produced in calves and in bulls.†

LIVING MOLLUSCOUS ANIMALS IN DILUVIAL DEPOSITS.

The following statement is by Professor Eaton, of New York: "The diluvial deposits in the great diluvial trough, through which the Erie canal is made, contain ridges of hard, compact gravel. A remarkable ridge of this kind lies in an oblique direction across the canal, running south-westerly from the village of Rome sixteen miles west of Utica. While cutting through this ridge, the workmen found several hundred of live molluscous animals. They were chiefly of the *Mya cariosa* and *Mya purpurea* (Uni of Bruguieres and Barnes.) I have before me several of the shells from which the workmen took the animals, fried and ate them. M. Brainard, who now resides at the place, and keeps a public-house on the banks of the canal, was present at the time, and will give the curious a satisfactory account of it. I have received several of the shells, with satisfactory assurances that the animals were taken alive from the depth of forty-two feet in the same deposit and near the same place.

"My object is to present a case where the deposit is decidedly diluvial; consequently these animals must have lain from the time of the deluge: for the earth in which they are found is too compact for them to be produced by a succession of generations. Therefore the lives of these animals are greatly prolonged by exclusion from air and light, or their natural age is more than 3,000 years.

"These fresh-water clans of 3,000 years old precisely resemble the same species which now inhabit the fresh waters of that district." ‡

* Phil. Mag. † Edinburgh Journ. Nat. & Geo. Science.
‡ Silliman's Journal.

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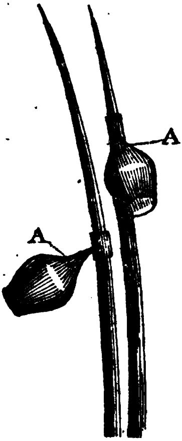
NIDUS ON A RUSH.

By a Correspondent of the Magazine of Natural History.



The annexed Cut represents a nidus or nest attached to a rush; the nest in the figure being half its natural size. I discovered it whilst botanising in the early part of the summer, and so closely does it resemble a flower, that I mistook it for one, even after it was in my hand. It is perfectly white, and of manufacture the most finished. The lower end is quite flat, with edges as sharp in proportion as those of the crown of a hat, which I consider a great peculiarity, as I cannot recollect any insect manufacture of a web-like material, whether nidus of spider, or cocoon of caterpillar, except such as are round or oval, and certainly none with sharp edges such as I describe. As I found two of them, I cut one open, and found about a dozen eggs sticking to the base at A, but not occupying one-tenth of the interior.*

De Geer has given, in detail, an account of some similar ones that he met with both in Holland and Sweden. The first he observed were suspended in a hay chamber, and he noticed others afterwards in similar places. He describes them as composed of silk of a dirty white, in the form of little oval bags, suspended by a slender but strong thread. They were nearly of the shape of hens' eggs, and were so thin that the eggs they contained might be seen through them. When the eggs hatched, they produced a spider, which he names *Aránea tuberculàta*. He afterwards found, suspended to stalks of grass, &c., other nests, more nearly resembling those figured above, which he describes as of the size of a small pea, of the shape of a bottle, with the bottom flat, containing about a dozen eggs, which also produced spiders. Most probably, the nidus described contained the eggs of some spider frequenting the water.†

INFLUENCE OF CHEMICAL SOLUTIONS ON PLANTS.

This subject has been taken up experimentally by M. Wiegmann, whose object was to ascertain the influence of chemical solutions when applied to the roots of the plants, and taken in by absorption. His method was to put the liquids into vessels, into which were also then immersed the pots in which the plants were growing, the earth having been previously allowed to dry freely. In this manner it was found that the neutral solutions of acetate of mercury, acetate of lead, sulphate of copper, muriate

* Mag. Nat. Hist. No. 6. † Ibid. No. 9.

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of tin, muriate of manganese, nitrate of cobalt, nitrate of bismuth, tartrate of antimony, muriate of barytes, muriates of strontian, and solutions of white arsenic and dilute prussic acid, destroyed plants previously full of vigour, either in the course of a few days, or a week. On the contrary, solutions of the sulphates of iron and zinc, muriates of titanium, iron and lime, and sulphates of alumina and magnesia, produced no prejudicial action.

When sought for, all the substances used were found in the plants, so that in opposition to what Mr. Murray had said, absorption had taken place by the roots.

Solutions of opium, hemlock, henbane, digitalis, and vomica nut, in the proportion of twenty grains of extract in two ounces of distilled water, poured into pots containing young plants of the family Chenopodus, caused death in from four to eight days.

Phillip's experiment in watering a plant with sulphate of copper, and killing it, was repeated, also the absorption of copper and its precipitation on a knife verified. Solution of four ounces of acetate of lead applied to a young willow did not kill it, probably because the carbonic acid disengaged by the roots precipitated the metal. A similar experiment with two ounces of white arsenic, only made the tree to which it was applied grow more rapidly—M. Weigmann thinks, because the arsenic was in too small a quantity, and acted only as a stimulant.*

EARTHQUAKES.

In mentioning the occurrence of several shocks of an earthquake at Copenhagen, we cannot avoid alluding to the singular coincidence of several earthquakes having within a few months been felt in several places remote from one another. The first of these was on the morning of the 18th of September, 1829, when, after seven o'clock, two very strong shocks, whose motions appear to have been vertical, occurred at Calcutta. On the 21st of March, 1829, the first shock of a severe earthquake was felt at Murcia in Spain, and followed by others, which rent the earth, and swallowed up or destroyed more than 3,600 houses in the province. The deep communications of this earthquake are attested by the geognostic structure of the country, which is very modern, and not volcanic, (calcareous and gypseous formations, soft clay and yellow sand.) Its motion, nevertheless, appears, from the only published account, to have been vertical. Its progress was marked by shocks at Colmar (Upper Rhine) on the night of August the 7th; at Poutroye and at Beffort the shock was stronger, and accompanied by a noise like distant thunder. The earthquake was also felt (according to a letter from the Minister of the Interior to the Academy of Paris) at Saint Dié and at Strasburg. The shock felt at Copenhagen was on the 19th of August, 1829,

* Bull. Univ.

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at about half-past three o'clock. Its direction was north-west; it lasted some seconds, and was preceded by much noise. The barometer rose at twelve o'clock three inches, but was not affected at the moment of the shock. Copenhagen was similarly affected by the earthquake at Lisbon, but has not in the interval felt any other shocks.*

ARTIFICIAL INCUBATION.

M. Lotz has stated in the *Iris*, that the greatest difficulty in artificial incubation is to graduate the heat properly; for which purpose he has supplied the following table, the result of his own experiments.

Days.	Pheasants †C.°	Pea Fowl. C.°	Guinea Fowl. C.°	Partridge. C.°	American Duck. C.°
1	5	5	5	5	5
2	10	10	10	10	10
3	13	13	13	13	13
4	16	16	16	16	16
5	19	19	19	19	19
6	22	22	22	22	22
7, 8, 9	25	25	25	25	25
10	30	30	30	30	30
11, 12, 13, 14	33	33	33	33	33
15, 16, 17	38	38	38	38	36
18, 19	38	38	38	38 . 5	36
20	38 . 5	39	39	39 . 5	36
21, 22, 23	38 . 5	39	39	39 . 5	37
24	38 . 5	39	39	39 . 5	37 . 5
25		39	39 . 5		
26		39 . 5 ‡			

RATIO OF THE BIRTHS OF MALES AND FEMALES RELATIVE TO THE AGE, &c. OF THE PARENTS.

By Professor Hofacker.

1. In marriages, where the mother is older than the father, the number of boys (which generally is in the ratio of 101 : 100) is to that of the girls : : 90·6 : 100.

* Edin. Journ. Nat. Geo. Science. † Centigrade Thermometer: for the scale compared with Reaumur and Fahrenheit, see *Companion to the Almanac* for 1830, p. 91. ‡ Brande's Journal.

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2. When the parents are of the same age, the ratio of the boys to the girls is 92 : 100.

3. If the father be from 3 to 6 years older than the mother, 103·4 boys : 100 girls, nearly the ordinary proportion in Europe.

4. If the father be from 6 to 9 years older than the mother, boys : girls : : 124·7 : 100.

5. If the father be from 9 to 12 or more years older than the mother, boys : girls : : 145·7 : 100.

6. If the father be 18 years and upwards older than the mother, boys : girls : : 200 : 100.

7. Young men, from 24 to 36 years of age, with young women from 16 to 26, change the ratio to 116·6 boys : 100 girls.

8. Young men with older wives, between 36 and 46 years of age, have boys : girls : : 95·4 : 100.

9. Men of a middle age, from 36 to 48 years, with young wives, have boys : girls : : 176·9 : 100.

10. Middle aged men, from 36 to 48 years, with wives of a middle age, have boys : girls : : 114·3 : 100.

11. Middle aged men from, 36 to 48 years, with older wives, have boys : girls : : 109·2 : 100.

12. Older men, from 48 to 60, with young wives, have given no determinable result, on account of the small number of observations.

13. Older men with wives of a middle age, have boys : girls : : 190 : 100.

14. Older men with older wives, boys : girls : : 164 : 100.

Many of the above proportions are directly at variance with those of M. Giroue de Buzaiengues, and to ascertain the value of them, we should know the data on which they rest, and which have not been given.*

ON THE DIFFERENT COLOURS OF THE EGGS OF BIRDS.

By M. Gloger. Verand der Gesells. Natur. Freunde in Berlin.

It is a remarkable provision of nature, that birds, whose nests are most exposed, and whose eggs are most open to the view of their enemies, lay eggs of which the colour is the least distinguishable from that of surrounding objects, so as to deceive the eye of birds or of other plundering animals; while birds, the eggs of which have a bright, decided colour, and are consequently very conspicuous, either conceal their nests in hollows, or only quit their eggs during the night, or begin to sit immediately. It is also to be remarked, that in the species of which the nest is open, and the female brings up the brood without the assistance of the male, these females are generally of a different colour from the male, less conspicuous, and more in harmony with the objects around. The foresight of nature has, therefore,

* Brande's Journ.

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provided for the preservation of the species of which the nest is altogether exposed, by imparting to the eggs a colour which will not betray them at a distance, while she could, without inconvenience, give the brightest colour under circumstances where the eggs are concealed from view. Or, perhaps, to speak more correctly, numerous birds can deposit their eggs in places accessible to view, because the colour of the eggs makes them confounded with the surrounding objects, while other birds are obliged to conceal their nests, because the conspicuous colour of the eggs would have attracted their enemies. Let the explanation, however, be what it may, the fact exists, and M. Gloger, who has examined all the birds of Germany, has satisfactorily proved it.

Eggs must be distributed into two series according as their colour is simple or mixed. The simple colours, such as white, blue, green, yellow, are the brightest, and consequently the most dangerous for the eggs.

1. The pure white, the most treacherous of colours, is found among birds which breed in hollow places, like the woodpeckers, the wrynecks, the roller, the merops, the kingfisher, the snow bunting, the robin, the water owzel, the swallow, the martin. It is only among these birds that the eggs are of a remarkable whiteness. The eggs are also white among some species which, like the domestic swallow, certain passeres, the troglodites, &c. constructed their nests with such narrow openings, that the eye of their enemies cannot penetrate within. White eggs are also found with birds that quit them only during the night, or at least very late during the day, such as the owls and falcons. Lastly, this colour is found among birds which have only one or two eggs, and sit immediately after, like the pigeons, the boobies, and the petrels.

2. As to the bright green or blue colour, it is found to belong to many species which make their nests in hollows, like the starling, the bullfinch, the fly-catcher, &c. In the second place, this colour is common to the egg of birds, the nests of which are constructed with green moss, or placed at least in the midst of grass, but always well concealed, such, for example, as the tomtit, linnet, &c. Lastly, green eggs are met with among many strong birds able to defend themselves against plunderers, like the herons.

3. A light green colour, verging towards a yellowish tint, is found among the eggs of the many gallinaceæ which lay among the grass without making a finished nest, which soon disappears beneath the quantity of eggs; like the hopoe, the perdrix cinereus, the pheasant. The same colour is also remarked among several of the palmipedes, which quit their eggs when they lay them, but which are attentive in watching them, as the swans, the geese, the ducks, the divers, &c. The eggs of certain great birds which make their nests in the open air, but are well able to defend themselves, are a dirty white, as may be observed among the vultures, eagles, and storks.

Among the eggs of a mixed colour, they are to be distinguished which have a white ground, and those of which the ground differs from white. The eggs with a white ground are those of the European oriole, the long-tailed tit, the cole-tit, the nut-hatch, the creeper, and the common swallow.* Most of the eggs with a white ground are concealed in well-cover-

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ed nests. The eggs of a mixed colour, and of which the ground is not white, at least of a pure white, are those of the lark, the grasshopper-lark, the yellow hammer, the wag-tail, &c.; then the crows, the jays, the thrushes, the quails, &c., with most of the singing birds, the colour of the interior of whose nest harmonizes with that of the eggs.

We have inserted an abstract of M. Gloger's paper, from the attention which his hypothesis seems to have met with from continental naturalists. For ourselves, we have been led to conclude that he is among the number of philosophers who first imagine a system, and then would elaborate facts to support it. The rooks, for example, build a nest particularly exposed on the highest trees; the jackdaws conceal theirs in holes, while the lapwing, woodcock, and snipe lay on the bare ground, and yet the colour of the eggs of all these birds is nearly identical: again, the blackbird and song-thrush are birds of very similar habits; they build in the same places, but the blackbird lays a dull rusty-coloured egg, and the thrush a clear blue one, with a few dark, well-defined spots. The woodpeckers, it is asserted, lay white eggs; they ought according to the theory, but their practices seem very different. The hawks which are so able and accustomed to defend their nests, we should expect to find with pure white eggs, but they are dull-coloured and inconspicuous—the buzzards, the most cowardly among the tribe, have perhaps the most conspicuous eggs of that tribe. The magpie is a strong bird, its eggs well concealed, and the nest fortified; but the colour of this egg is dull, like the rook, woodcock, &c. Two very similar eggs are those of the redstart and hedge-sparrow; the former builds in holes, the latter does not. The cuckoo very commonly selects the nest of the hedge-sparrow, a spotted brown egg among bright blue. Now if we admit that the brightest white eggs are to be found in birds whose nests are the most concealed, as the king-fisher, wryneck, wrens, tits, sparrows, and especially the sand-martin, may we not rather infer that, because the interior of these nests is peculiarly dark, the bright white colour is convenient to the bird, to enable her to distinguish them? At all events, we must regard M. Gloger's hypothesis as ingenious, rather than supported by facts.*

APPEARANCE OF FISH AND LIZARDS IN EXTRAORDINARY CIRCUMSTANCES.

By Joseph E. Muse.

In the course of last summer, I ordered a ditch to be cut of large dimensions, on a line of my farm near Cambridge: the line was a plane, ten feet above the level of the neighbouring river, and at least one mile from it, at the nearest point of the line; a portion of the ditch being done, the work was interrupted by rain

* Brande's Journal.

for ten or twelve days; when the work was resumed, on examining the performance, I discovered that the rain water which had filled the ditch, thus recently cut, contained hundreds of fish, consisting of two kinds of perch which are common in our waters, the "sun perch," and the "jack perch;" the usual size of the former is from six to twelve inches, the latter varies from ten to fifteen inches long; those in the ditch were from four to seven inches. By what possible means could these fish have been transported so far from their native waters? There is no water communication on the surface to conduct them there; the elevation and extent of the plane in regard to the rivers, utterly prohibit the idea; the eggs, if placed there by a water-spout, could not have suffered so rapid a transmigration; no such phenomena had been observed, and the adjacency of the line to the dwelling, would have rendered the occurrence impossible without notice.

A similar occurrence a few years ago, I witnessed on the same farm; in a very large ditch, cut on lower lands, on a line equally unconnected with any river, pond, or other surface-water, there were, under very similar circumstances, numerous perch, which afforded fine angling to my children. In a diary which I keep, I have entered, that several of them measured as much as twelve inches in length, and that the time since their arrival there, could not possibly have exceeded a fortnight.

While on the subject of mysterious Nature, I will introduce, as concisely as possible, a case where she reconciled animals of the coldest and most meagre habits, to the enjoyment of the warmth and luxuries of the human stomach; for these facts, though not personally conversant with them, I have the authority of a medical gentleman of unquestionable veracity, to vouch for their rigid truth. In reply to my request to be informed of the habits, food, drink, enjoyment, &c. of the patient, I received the following account. "On my arrival I found that she (the patient) had puked up two ground puppies, and was labouring under a violent sick stomach, with pain, and syncope: the first was dead when ejected, the second was alive when I arrived, and ran about the room; they were about three inches long. She informed me that on the road that morning she had thrown up two others. The case occurred in the summer, and had made gradual progress, from the first of April, and as she described it, with a peculiar sickness, and frequent sensation of something moving in her stomach; with slight pain and loss of appetite, which increased till her illness. She was about twenty years of age, and had enjoyed good health. Her employment had confined her in the swamp, during the winter and spring, and she had from necessity, constantly drunk swamp water." The physician administered an emetic in quest of more puppies, but, being disappointed, he gave an opiate; she was relieved, finally, and has been since in health.

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These animals have since been shown to me: they are not the ground puppy, (gecko,) as they are vulgarly called. They resemble it very much, but are easily distinguished from it. They belong to the same genus, (lacerta or lizard,) but are of the species "salamander;" their habitudes too, are essentially different. The gecko is found in houses and warm places; the salamander in cold damp places, and shaded swamps, and by the streams of meadows; these animals, though oviparous, hatch their eggs in the belly like the viper, and produce about fifty young at a birth. The inference is irresistible, that the patient had, in her frequent draughts of swamp water, swallowed, perhaps thousands of these animals in their nascent, or most diminutive state of existence, and a few only survived the shock; but it is a matter of astonishment, that from the icy element in which they had commenced their being, and for which they were constituted by Nature, they should bear this sudden transportation to a situation so opposite in its character, and grow into vigorous maturity, unannoyed by the active chemical and mechanical powers to whose operation they were subjected.*

THE PENGUIN.

The great peculiarity of structure in this amphibious bird is its great and excessively distended jugular veins being near two inches in diameter. Capt. Webster, in a letter to Mr. Barrow, of the Admiralty, on the Natural Productions of Staten Island, and Cape Horn, says, I merely mention this one point respecting the anatomy of the penguin, to associate it with the prodigious and enormous abdominal venous sinus of the sea leopard or leopardine seal of Jameson, which you will scarcely credit to be seventeen inches in diameter. That an animal of five or six cwt. and of seven or eight feet in length, should have a venous sinus of seventeen inches diameter, stretching from hypochondrium to hypochondrium, seems incredible;—unparalleled as it is, such is the fact. The skins and heads of five are sent home.†

DISSECTION BY INSECTS.

Mr. Carpenter having had many specimens of insects destroyed by the Termes pulsatorium, it occurred to him that their destructive powers might be turned to account, in making some delicate dissections for the microscope, and accordingly he placed a few of them in a pillbox, with the heads of three dead flies. On looking into the box some time after, to see how they had proceeded in their anatomical operations, he found they had completely cleared the interior of some of the eyes from all the blood-vessels, leaving the lenses in the corner most beautifully trans-

* Silliman' Journ. † Brewster's Journ.

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parent; thus evidencing how useful they might be made in exceedingly fine dissections.*

INFERIOR DEXTERITY OF THE LEFT HAND.

M. Le Comte refers the inferior power of the left arm to the position of the fœtus during the last months of gestation, the left side being usually pressed against the bones of the pelvis, and consequently obstructing the circulation. The effect is farther increased by nurses carrying children on their right arm; and by the care taken to teach children not to use their left hands.†

HANDS OF THE WHALE.

The breast fins of the whale, instead of being composed of straight spines like those of fishes, conceal bones and muscle formed very like those of the fore legs of land animals; but so enveloped in dense skin, that the fingers have no separate motion, though the hand (if it may be called so) is flat, very pliant, large and strong, enabling the whale to sustain the young closely compressed to its body, as was remarked by Aristotle. The gradation of the hand, as it appears in apes, &c., may be traced in the otter, seal, walrus, manati, and dugong, into the whale.‡

PRESERVATION OF SMALL BIRDS.

Remove the viscera, brain, eyes, and tongue with a hooked wire; fill all the cavities with antiseptic paste, or cotton saturated with it; bind the bill and wings with thread, hang it up by the legs, pour from one to two ounces of ardent spirits into the vent, and leave it to dry in an airy place. The paste is made with eight parts of white arsenic, four parts of Spanish, and one part of soft, soap, and three parts of camphor, with a few drops of alcohol.§

SPIDERS LIVE AND GROW WITHOUT FOOD.

Out of fifty spiders produced on the last day of August, and which were kept entirely without food, three lived to the 8th of February following, and even visibly increased in bulk. Was it from the effluvia arising from the dead bodies of their companions that they lived so long? Other spiders were kept in glass vessels without food from the 15th of July till the end of January. During that time they cast their skins more than once, as if they had been well fed.

M. Rennie, an intelligent correspondent of the *Magazine of Natural History*, enclosed a packet of spider's eggs in a paste-

* Gill's Tech. Rep.
† Journ. Phys. Exp.
‡ Dr. Harwood's Lect.
§ Corres. Mag. Nat. Hist.

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board box, which were soon hatched but afterwards forgotten and neglected for about two months, when they were all found dead but two, which had cast their skins, and increased in size; but, though he fed them with flies and gnats, they soon died.*

DEATH WATCHES.

These little creatures, whose portentous click once made stout hearts quail, and still inflicts no small terror on many an ancient dame, even in these days of enlightenment, are thus decribed by Mr. Carpenter:—This singular noise proceeds from two different insects. One of these, the Anòbium tessellàtum, is coleopterous, of a dark colour, and about a quarter of an inch in length. It is chiefly in the latter end of spring it commences its noise, which may be considered analogous to the call of birds. This is caused by beating on hard substances, with the shield or fore-part of its head. The general number of successive distinct strokes is from seven to nine, or eleven. These are given in pretty quick succession, and are repeated at uncertain intervals. In old houses, where the insects are numerous, they may be heard, if the weather be warm, almost every hour in the day. In beating, the insect raises itself upon its hinder legs, and, with the body somewhat inclined, beats its head, with great force and agility, against the place on which it stands. This insect, which is the real death-watch of the vulgar, must not be confounded with a minuter insect, not much unlike a louse, which makes a ticking noise like a watch; but, instead of beating at intervals, it continues its noise for a considerable length of time without intermission. This latter insect, the Térmes pulsatòrium *Linn.*, belongs to a very different tribe (Neuróptera). It is usually found in old wood, decayed furniture, museums, and neglected books. The female lays her eggs, which are exceedingly small, in dry dusty places, where they are likely to meet with least disturbance. They are generally hatched about the beginning of March, a little sooner or later, according to the weather. After leaving the eggs, the insects are so small as scarcely to be discerned without the use of a glass. They remain in this larva state about two months, somewhat resembling in appearance the mites in cheese; after which they undergo their change into the perfect insect. They feed on dead flies and other insects; and often from their numbers and voracity, very much deface cabinets of natural history. They subsist on various other substances, and may often be observed carefully hunting for nutritious particles amongst the dust in which they are found, turning it over with their heads, and searching about somewhat in the manner of swine. Many live through the winter, buried deep in the dust, to avoid the frost.*

* Mag. Nat. Hist.

† Gill's Tech. Repos.

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THE CHAMELEON'S ANTIPATHY TO BLACK.

WHATEVER may be the cause, the fact seems to be certain, that the chameleon has an antipathy to things of a black colour. One, which Forbes kept, uniformly avoided a black board which was hung up in the chamber; and, what is most remarkable, when it was forcibly brought before the black board, it trembled violently, and assumed a black colour.

It may be something of the same kind which makes bulls and turkeycocks dislike the colour of scarlet, a fact of which there can be no doubt.*

THE EARTHWORM OVIPAROUS.

M. LEON DUFOUR appears to have determined that the earthworm (*Lumbrícus terréstris*) is an oviparous and not a viviparous animal. The eggs are of a very peculiar structure, being long, tapering, and terminating at each end by a pencil of fringed membranaceous substance. They have more the appearance, indeed, of a chrysalis or a cocoon, than of an egg; but their pulp, &c., prove them to be true eggs. The worms when hatched are very agile, and when disturbed will sometimes retreat for safety within the shell which they have just quitted, or instinctively dig into the clay.†

DISTANT SIGHT.

ROSS, in his *Voyage to Baffin's Bay*, proved that a man, under favourable circumstances, could see over the surface of the ocean to the extent of 150 English miles. It is not probable that any animal exceeds this power of vision, though birds, perhaps, excel men and most quadrupeds in sharpness of sight. Schmidt threw at a considerable distance at a thrush (*Túrdus musicûs*) a few small beetles of a pale grey colour, which the unassisted human eye could not discover, yet the thrush observed them immediately and devoured them. The long-tailed titmouse (Pàrus caudàtus) flits with great quickness amongst the branches of trees, and finds on the very smooth bark its particular food, where nothing is perceptible to the naked eye, though insects can be detected there by the microscope. A very tame red-breast (Sylvia Rubécula) discovered flies from the height of the branch where it usually sat, at the distance of eighteen feet from the ground, the instant they were thrown down; and this, by bending its head to one side, and using, of course, only one eye. At the same distance a quail discovered with one eye some poppy seeds, which are very small and inconspicuous.‡

* Mag. Nat. Hist. † Ann. Sc. Nat.

‡ From the German.

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CUVIERIAN SYSTEM OF ZOOLOGY.*

CUVIER, in his *System*, thus forms the four subdivisions or classes of vertebrated animals, which are,—

Class 1. *Mammiferous Animals*, which bring forth their young alive and suckle them, being provided with teats (Lat. *mammæ*,) whence the name is derived.

Class 2. *Birds*. Class 3. *Reptiles*. Class 4. *Fish*.

The general plan of the skeleton is the same in each class, though it admits of considerable modifications, as may be per-

a *b* *c* *d*

ceived by the annexed figures. Fig. *a* represents the human skeleton, man being placed at the head of the mammiferous class; *b*, the skeleton of a bird; *c*, that of a frog; and *d*, the skeleton of a fish. Man is preeminently gifted by his Creator with superior intellectual powers; he is distinguished also by his erect posture, which required a structure varying considerably from that of mammiferous quadrupeds: had we chosen the skeleton of any of the lower orders of this class, the form would have approached more closely to those of the other classes, but taking the extremes of the grand division of vertebrated animals, we still perceive the leading characters of the osteology to be the same: namely, a skull containing the brain, supported by the vertebral column which contains the spinal cord, and to which the ribs are attached. With respect to the limbs, they admit of a great variety of form suited to the wants of the animal, and in the lowest order of the mammiferous class, which comprises dolphins and whales, we find only one pair of limbs, and in the

* We abridge this paper, and copy the Engraving, for the very accurate idea it affords of the distinctive characters of the respective classes.—ED.

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latter, they are so concealed in the flesh, as not to be visible. The upper limbs of birds do not terminate in toes or claws. Some reptiles have only one pair of limbs, others, as serpents, have none.

The distinctive characters of the four classes above enumerated founded not on the form of the skeleton, but on the circulation and respiration, are thus given by Cuvier.

Mammiferous Animals have a double circulation, and the aërial respiration is simple, viz. it is effected by the lungs only.

Birds exceed mammiferous quadrupeds in the quantity of their respiration, for they have not only a double circulation, and an aërial respiration, but they respire also through other cavities besides the lungs, the air penetrating through the whole body, and bathing the branches of the aorta or great artery of the body, as well as those of the pulmonary artery.

Fishes have a double circulation, but their respiratory organs (the gills) are only formed to respire by the intervention of water, and their blood only receives the portion of oxygen dissolved or mixed in the water, so that the quantity of respiration is, perhaps, less than that of the next class reptiles.

Reptiles. The organs of circulation are simple, and only a portion of the blood brought back by the veins passes through the organs of respiration. Their quantity of respiration, and all the other qualities that depend on it, vary according to the proportion of blood which enters the lungs at each pulsation.

In mammiferous quadrupeds the quantity of respiration is less than that of birds; but it is greater than that of reptiles, on account of the structure of the respiratory organs; and exceeds that of fishes, on account of the different elements in which they live. Hence result the four kinds of movements, which the four classes of vertebrated animals are particularly destined to exert.

Mammiferous animals, in which the quantity of respiration is moderate, are generally formed to develope their strength in walking or running. Birds, which have a larger quantity of respiration, have the activity and strength of muscles necessary for flying. Reptiles, in which respiration is more feeble, are condemned to crawl; and many of them pass a part of their lives in a kind of torpor. Fishes require to be supported in an element nearly as heavy as themselves, in order to exert their proper motions in swimming.

All the circumstances of organization proper to each of the four classes, and particularly those which regard their movements and exterior sensations, have a necessary relation with their essential characters; nevertheless, the class of mammiferous animals has particular characters belonging to their viviparous generation, the manner in which the fœtus is nourished in the womb by means of the placenta, and the teats with which they suckle their young. On the contrary, the other three classes are oviparous; and if we contrast them together with the first class, we shall find certain resemblances which indicate in the three classes,

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birds, fishes, and reptiles, a special plan of organization, comprised in the general plan of all vertebrated animals.*

TURTLES.

The Tortuga or large fresh-water turtle travels far at times. It deposits its eggs in the sand with surprising address. The land turtles, it is said, are most stupid in this particular, dropping their eggs, one by one, as they hobble over the ground, neither covering nor taking any care of them whatever, nor paying any regard to their offspring. The tortuga, on the contrary, covers its eggs so accurately as to leave no signs perceptible of its nest; and, however strange it may seem, she so arranges it as to make her track appear unbroken over the sands, and, after laying her eggs, she proceeds on again in the same direction to complete the deception.†

THE BLACK SWAN.

When the classical writers of antiquity spoke of the black swan as a proverbial rarity, so improbable as almost to be deemed impossible, little did they imagine that in these latter days a region would be discovered, nearly equal in extent to the Roman empire even at the proudest period of its greatness, in which their "rara avis" would be found in as great abundance as the common wild swan upon the lakes of Europe. Such, however, has been one of the least singular among the many strange and unexpected results of the discovery of the great southern continent of New Holland.‡ Scarcely a traveller who has visited its shores omits to mention this remarkable bird. An early notice of its transmission to Europe occurs in a letter from Witsen to Dr. Martin Lister, printed in the twentieth volume of the Philosophical Transactions; and Valentyn published in 1726 an account of two living specimens brought to Batavia. Cook, Vancouver, Phillip, and White, mention it incidentally in their voyages; and Labillardière, in his Narrative of the Expedition of D'Entrecasteux in search of La Pérouse, has given a more particular description, together with a tolerable figure. Another figure, of no great value, has also been given by Dr. Shaw in his Zoological Miscellany.

Since this period many living individuals have been brought to England, where they thrive equally well with the emus, the kangaroos, and other Australian animals, insomuch that they can now scarcely be regarded as rarities even in this country. They are precisely similar in form and somewhat inferior in size to the wild and tame swans of the old world; but are perfectly black in

* Mag. Nat. History. † Jameson's Journ.

‡ Where one of the rivers is named "Swan River." See "Expeditions of Discovery" in the present volume.

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every part of their plumage, with the exception of the primary and a few of the secondary quill-feathers, which are white. Their bill is of a bright red above, and is surmounted at the base in the male by a slight protuberance, which is wanting in the female. Towards its anterior part it is crossed by a whitish band. The under part of the bill is of a greyish white; and the legs and feet are of a dull ash colour. In every other respect, except in the mode of convolution of its trachea, this bird so perfectly corresponds with its well-known congeners, that it is only necessary to refer to any species for an account of the characters which are common to them all.

The black swans are found as well in Van Dieman's Land as in New South Wales, and on the western coast of New Holland. They are generally seen in flocks of eight or nine together, floating on a lake; and when disturbed, flying off like wild geese in a direct line one after the other. They are said to be extremely shy, so as to render it difficult to approach within gunshot of them.*

BISONS IN LITHUANIA.

The Bison, called in Polish Zuby, has disappeared from Europe, with the exception of the forest of Bialowiez, in Lithuania, wherein, as appears from an official return which has just been published, there were, in 1824, 543 large and small. The Russian government has taken measures for the preservation of this valuable race of animals.†

EXTRAORDINARY PHYSICAL DEVELOPEMENT IN A BOY SIX YEARS OF AGE.

By Thomas Smyth, Esq., Surgeon, Kingussie.

J—— M—— the subject of the present case, was born at Kingussie, Invernesshire, in the month of October 1822. He is a natural son, and, from circumstances unnecessary to be mentioned, fell entirely under the care of his grandmother when he was about nine months old. He was nursed with his mother's milk eight months and a-half only, and, during the whole of that time, was fed also with spoon-meat, viz. porridge and milk or small beer, twice a-day. At the time of his birth he was rather a puny child, and showed no signs whatever of extraordinary growth, till he was at the age of six months. The first time the attention of the writer of this paper was attracted to this boy was in the summer of 1826.

At present (July 1829), he is six years and two months old. His height 4 feet 2 1-10th inches. He weighs 74 lbs. avoirdupois, with his clothes on. The length of his body is remarkable, being 20 inches from the collar bone to the pubes; the length of

* Gard. and Menag. Zoolog. Soc. No. 3.

† Jameson's Journ.

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the head, neck, and lower extremities being consequently 80 inches, 11 of which are occupied by the head and neck: so that the length of his lower extremities is only 19 inches, which is less than that of his body by an inch, a proportion entirely infantile. Round the lower part of his neck he measures 14½ inches; round the head, immediately above the ears and eyebrows, 22¼ inches, the height of his forehead is 2 inches; the length of his face, including forehead, 6½ inches. An extraordinary ridge runs up the middle of his forehead, in the line where the frontal bone is divided in the fœtus into two equal parts, and which, in ordinary cases, is marked by a slight depression. The temporal ridge of the frontal bone also presents a peculiarity, having a hollow, not only on the side next the temple as usual, but also on the frontal side. The perpendicular height of the head, from the meatus externus of the ear to the top of the head, is 5 inches. The developement of the fleshy parts of the thighs and legs, arms and fore-arms, particularly towards the upper part of each, give a singular appearance to this boy, and suggests to the writer of this the idea of the muscles having grown without a corresponding elongation of the bones. Hence the vasti externi, the deltoid, the biceps, and supinator muscles, appear like huge lumps towards the upper end of the bones. The penis and testes are as large as those of most men, if not larger. The pubes is covered with black curly hair. He has also short dark-coloured mustachios, but no hair on his chin. A sort of down, of the the same light brown colour of the hair of his head, appears in the place of whiskers. His eyes are uncommonly sunk, and appear dull, and somewhat inanimate.

To render my observations in respect to the organic developements as complete as possible I measured the *facial angle*, and found it to be 83 degrees. It is obvious that this angle must be much affected by the state of the frontal sinuses. In this boy, the uncommon projection of the upper parts of the orbits of the eyes, as well as of the lower part of the ridge running up the middle of the forehead, suggest the idea of uncommon largeness of the whole frontal sinuses; and this suggestion will be still farther confirmed by the deep hollow tone of voice which this boy has, if, as is commonly thought, the enlargement of these sinuses is attended with effect. If the quantity of brain in the upper and anterior part of the cavity of the cranium has anything to do with the intellectual functions, as some appear to think, there is another angle which it may be of still more importance to measure than the facial angle of Camper. The angle I mean is that which is formed by the meeting of a line drawn along the face of the brain, with another line drawn along the forehead, parallel to the inner table of the scull. This may be called the *basi-frontal* angle, and is found to vary considerably in different persons. In persons of undoubted great capacity, this angle has been found as high as 110 or 114 degrees, while in some of an

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opposite nature, it has been found as low as 90 to 99 degrees. In J—— M—— the basi-frontal angle is 90 degrees.

Having stated the principal organic developements of this extraordinary boy, we now come to what, in a philosophical point of view, is the most interesting part of the subject, namely, to inquire, whether and how far, these are accompanied by corresponding functional developements. Among the results of these inquiries are,

He has enjoyed almost uninterrupted good health from the time of his birth up to the present day. He sleeps soundly about nine hours in the twenty-four in summer, and eleven or twelve in winter. His natural functions are quite regular.

He began to walk at or about the age of nine months. His strength is extraordinary for his age, though not disproportionate to his muscularity. I saw him lately lift from the ground an anvil, weighing 146 lbs. avoirdupois. A year ago, if not earlier, he could carry two stoups full of water for a considerable distance. He runs swiftly, though awkwardly. Though conscious, and even boastful of his strength, he shows no disposition to quarrel with or hurt children of the same age; on the contrary, he rather shuns than seeks contention But when provoked, he beats with ease boys twice his own age.

He has never exhibited any of that gaiety or playfulness of disposition that is common to children at his own time of life; nor does he join other children in their diversions, which may be partly owing to his own disinclination; partly to this, that he has never been looked upon as a fit associate by children of any age. From the circles of the younger he has been excluded, by reason of his disproportionate bulk and strength; and from that of the older, by his want of the necessary advances in intelligence, for, though his strength is immense, he certainly shows a decided want of skill to direct it.

I have been solemnly assured by his grandmother, and her report appears to be confirmed by all that I can learn from the neighbours, that he has never exhibited the slightest inclination towards the other sex.

In regard to the progress of his intellectual faculties, he is, and ever has been, decidedly behind other children of the same age. He was two years old before he could speak the two easiest words in his mother tongue (Gaelic), and he has not yet acquired almost one word of English, though that is the language commonly spoken by the children about him. From these circumstances, and from the dulness of his look and evident inactivity of mind, he was long considered to be what is called a *born idiot*. He was three years old before he acquired the common use of words.

In the case of J—— M—— the only circumstances in which he obviously differs from children of the same age, are his *precocity* of organic developement, attended with a decided *deficiency* of intellect, or activity of mind in an intellectual department. As the attentions that have of late been paid to him on all hands have evidently excited his ambition, and as he appears to have acquired a greater activity of mind in consequence, it will be highly interesting to observe the future reciprocal effects, if any, which his intellectual may have on the physical progress of further developement.*

* Brewster's Journal.

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MIGRATION OF THE HERRING AND MACKEREL.

In a recent paper, Major W. M. Morrison supports that view of the migration of gregarious fish which leads to the supposition, that they do not actually travel from north to south, but that in accordance with climate, successive shoals approach the coasts for the purpose of spawning; and this view he supports by some interesting facts. The nets of Hastings are always cast north and south, in order that they may drift with the ebbing and flowing of the tide, which takes the direction of east and west in that part of the British Channel; and it is curious, that while those fish which are encumbered with roes, are caught in great numbers on the east side of the nets, they are not met with in a greater proportion than one in about one hundred without roes on the west side.

The mackerel which are met with off Hastings, appear to be of a different species from those caught off Mount's Bay in Cornwall.

The fishermen of Cornwall, under the impression that the mackerel moved eastward along the coast, have endeavoured repeatedly, on their return, to meet them off the Praul Point, Portland Race, and off the Isle of Wight without success. With respect to the mackerel, his ideas do not appear to be very definite, and he questions whether they may not move north.*

HABITS OF THE PERCH.

The habits of the perch are not very social. It does not swim in groups or flocks like other fishes, but each has its separate attraction. Its motion in swimming is by bounds or leaps; and it is often seen in still waters darting forward with great rapidity to some distance, and afterwards remaining in its customary immobility. The perch rarely leaps out of the water, and comes seldom to the surface but in warm weather to seize the gnats or their larvæ. It feeds generally on worms, insects which swim or fly on the water, the smaller crustacea, and fishes; its voracity is extreme, and it sometimes chooses its prey without sufficient precaution. Thus the stickleback often occasions its death, by erecting its sharp dorsal spines at the moment the perch is about to swallow it, which stick in the palate or throat. Salamanders, small vipers, and young frogs also serve as food to the perch; and M. de Lacepede has assured Baron Cuvier that they even seize young water-rats.

The perch is better armed against the attacks of its enemies than most of the fresh water fishes. Its spines, when it attains any considerable size, protect it from the voracity of other fishes, and when full grown even the pike dares not attack it, though the very young perches are its favourite food. Several species

* Jameson's Journ.

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o. water birds, however, pursue the perch with avidity. It fears thunder, is afraid of frost and ice, and has internal enemies in intestinal worms, of which, according to Rudolphi, no less than seven species are found in the body of the perch. This fish is very tenacious of life, and Pennant asserts that it may be carried in dry straw for sixty miles without much danger.

It happens in certain circumstances that perches acquire a kind of protuberance or hunch, which renders them deformed.

The perches at Fahlun in Sweden, according to Linnæus, and those of a lake in Merionethshire in Wales, according to Pennant, are of this strange variety; and Sir W. W. Wynn, Bart., the proprietor of this lake, sent Baron Cuvier some individuals of this kind, which are now in the Royal Museum, at Paris. This malformation Cuvier attributes to the nature of the waters they inhabit.*

AMERICAN SONG BIRDS.

The *Mocking-bird* seems to be the prince of all song birds, being altogether unrivalled in the extent and variety of his vocal powers; and, beside the fulness and melody of his original notes, he has the faculty of imitating the notes of all other birds, from the humming-bird to the eagle. Pennant tells us that he heard a caged one, in England, imitate the mewing of a cat and the creaking of a sign in high winds. The Honourable Daines Barrington says his pipe comes the nearest to our nightingale of any bird he ever heard. The description, however, given by Wilson, in his own inimitable manner, as far excels Pennant and Barrington as the bird excels his fellow-songsters. Wilson tells that the ease, elegance, and rapidity of his movements, the animation of his eye, and the intelligence he displays in listening and laying up his lessons mark the peculiarity of his genius. His voice is full, strong, and musical, and capable of almost every modulation, from the clear mellow tones of the wood-thrush to the savage scream of the bald eagle. In measure and accent he faithfully follows his originals, while in force and sweetness of expression he greatly improves upon them. In his native woods, on a dewy morning, his song rises above every competitor, for the others seem merely as inferior accompaniments. His own notes are bold and full, and varied seemingly beyond all limits. They consist of short expressions of two, three or at most five or six syllables, generally expressed with great emphasis and rapidity, and continued with undiminished ardour, for half an hour or an hour at a time. While singing, he expands his wings and his tail, glistening with white, keeping time to his own music, and the buoyant gaiety of his action is no less fascinating than his song. He sweeps round with enthusiastic ecstasy, he mounts and descends as his song swells or

* Cuvier's great Work on Fishes.

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dies away; he bounds aloft as Bartram says, with the celerity of an arrow; as if to recover and recall his very soul, expired in the last elevated strain. A bystander might suppose that the whole feathered tribes had assembled together on a trial of skill; each striving to produce his utmost effect, so perfect are his imitations. He often deceives the sportsman, and even birds themselves are sometimes imposed upon by this admirable mimic. In confinement he loses little of the power or energy of his song. He whistles for the dog; Cæsar starts up, wags his tail, and runs to meet his master. He cries like a hurt chicken, and the hen hurries about, with feathers on end, to protect her injured brood. He repeats the tune taught him, though it be of considerable length, with great accuracy. He runs over the notes of the canary, and of the red bird, with such superior execution and effect, that the mortified songsters confess his triumph by their silence. His fondness for variety some suppose to injure his song. His imitations of the brown thrush are often interrupted by the crowing of cocks; and his exquisite warblings after the blue bird, are mingled with the screaming of swallows, or the cackling of hens. During moonlight, both in the wild and tame state, he sings the whole night long. The hunters, in their night excursions, know that the moon is rising the instant they begin to hear his delightful solo. After Shakspeare, Barrington attributes in part the exquisiteness of the nightingale's song to the silence of the night; but if so, what are we to think of the bird which, in the open glare of day, overpowers and often silences all competition? His natural notes partake of a character similar to those of the brown thrush, but they are more sweet, more expressive, more varied, and uttered with greater rapidity.

The *Yellow-breasted Chat* naturally follows his superior in the art of mimicry. When his haunt is approached, he scolds the passenger in a great variety of odd and uncouth monosyllables, difficult to describe, but easily imitated so as to deceive the bird himself, and draw him after you to a good distance. At first are heard short notes like the whistling of a duck's wings, beginning loud and rapid, and becoming lower and slower till they end in detached notes. There succeeds something like the barking of young puppies, followed by a variety of gutteral sounds, and ending like the mewing of a cat, but much hoarser.

The song of the *Baltimore Oriole* is little less remarkable than his fine appearance, and the ingenuity with which he builds his nest. His notes consist of a clear mellow whistle, repeated at short intervals as he gleams among the branches. There is in it a certain wild plaintiveness and *naïveté* extremely interesting. It is not uttered with rapidity, but with the pleasing tranquillity of a careless ploughboy, whistling for amusement. Since the streets of some of the American towns have been planted with Lombardy poplars, the orioles are constant visiters, chanting

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their native "wood notes wild," amid the din of coaches, wheel-barrows, and sometimes within a few yards of a bawling oyster-woman.

The *Virginian Nightingale, Red Bird, or Cardinal Grossbeak* has great clearness, variety, and melody in his notes, many of which resemble the higher notes of a fife, and are nearly as loud. He sings from March till September, and begins early in the dawn, repeating a favourite stanza twenty or thirty times successively, and often for a whole morning together, till, like a good story too frequently repeated, it becomes quite tiresome. He is very sprightly and full of vivacity; yet his notes are much inferior to those of the wood, or even of the brown thrush.

The whole song of the *Black-throated Bunting* consists of five, or rather two, notes; the first repeated twice and very slowly, the third thrice and rapidly, resembling *chip-chip, che-che-che;* of which ditty he is by no means parsimonious, but will continue it for hours successively. His manners are much like those of the European yellowhammer, sitting, while he sings, on palings and low bushes.

The song of the *Rice Bird* is highly musical. Mounting and hovering on the wing, at a small height above the ground, he chants out a jingling melody of varied notes, as if half a dozen birds were singing together. Some idea may be formed of it, by striking the high keys of a pianoforte singly and quickly, making as many contrasts as possible, of high and low notes. Many of the tones are delightful, but the ear can with difficulty separate them. The general effect of the whole is good; and when ten or twelve are singing on the same tree, the concert is singularly pleasing.

The *Red-eyed Flycatcher* has a loud, lively, and energetic song, which is continued sometimes for an hour without intermission. The notes are, in short, emphatic bars of two, three, or four syllables. On listening to this bird, in his full ardour of song, it requires but little imagination to fancy you hear the words "Tom Kelly! whip! Tom Kelly!" very distinctly; and hence Tom Kelly is the name given to the bird in the West Indies.

The *Crested Titmouse* possesses a remarkable variety in the tones of its voice, at one time not louder than the squeaking of a mouse, and in a moment after whistling aloud and clearly, as if calling a dog, and continuing this dog-call through the woods for half an hour at a time.

The *Red-breasted Blue Bird* has a soft, agreeable, and often-repeated warble, uttered with opening and quivering wings. In his courtship he uses the tenderest expressions, and caresses his mate by sitting close by her, and singing his most endearing warblings. If a rival appears, he attacks him with fury, and, having driven him away, returns to pour out a song of triumph. In autumn his song changes to a simple plaintive note, which is

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heard in open weather all winter, though in severe weather the bird is never to be seen.*

CHANGE IN THE COLOURS OF FLOWERS.

The *changing Hibiscus* has received this name on account of the remarkable and periodical variations which the colour of the flowers present. White in the morning they become more or less red or carnation-coloured towards the middle of the day, and terminate in a rose-colour when the sun is set. This fact has been long known, but we are totally ignorant of the cause. The following observation may assist to discover it, and give some useful ideas on the coloration of flowers.

M. Ramond de la Sagra remarked, in the Botanic Garden of Havanna, of which he is the director, that, on the 19th October, 1828, this flower remained white all day, and did not commence to redden till the next day, towards noon. On consulting the meteorological tables which he kept with care, he found that on this very day, the 19th October, the temperature did not rise above 65½ deg. Fahr. whilst ordinarily it was at least 86 degrees, at the period of inflorescence of this plant. It would appear then that the temperature holds a place of some importance in the coloration of certain flowers. The experiments of Mr. Macaire have taught, that it seems to be connected with different degrees of oxygenation of the chromule, or colouring matter, contained in the parenchyma. Is this oxygenation altogether or in part, determined by the temperature? Can the colour of certain petals be modified by variations of heat? These questions require experiments.†

RICE PAPER OF CHINA.

The article of commerce known in this country by the name of Rice Paper, is generally reckoned a composition of rice, from which circumstance it derives its common name. This, however, is an erroneous notion, as this beautiful paper, so well adapted from its softness, &c. for painting upon, is in reality the medulla or pith of a plant. It is not yet known, I believe, from what particular plant it is procured, nor have I ever been able to meet with any attempt to clear up the doubt which hangs over the subject. Whilst in Canton in October, 1828, I procured a specimen of the raw material from a native merchant in New China Street, which presents the following appearances:—It is about an inch in circumference, and I was told that the plant grew to the height of ten or twelve feet; externally it is of a white shining appearance, and very smooth on its surface; internally it is fistulous, the canal being divided, by membraneous expansions, into numerous partitions. In general aspect it is not much

* Mr. Rennie, in Mag. Nat. Hist. † Ann. de Sciences.

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unlike the pith of some of our rushes, though much more compact in texture, and seems undoubtedly to belong to the monocotyledonous class, and in all probability to the natural family of Junceæ, or rushes. Its substance is composed entirely of numerous cells, each being round, and connected by six loops to six surrounding cells.

The process of preparing this article for use, and forming it into the substance we see in this country, was described to me as very simple. The substance is first steeped for some time in water till softened; a sharp narrow knife is then thrust through the centre, and it is then rolled out upon the knife, after which it is submitted to considerable pressure.*

The subjoined extract from a letter by John Reeves, Esq. of Canton, a member of the Society of Arts, proves, however, that the rice paper is not a manufactured article, but an unchanged vegetable production, cut spirally, and afterwards flattened by pressure.

My son will soon forward to you a sheet of the substance, called in England "rice paper," and the piece of the plant (or I should rather say, of the branch of the plant) from which it is made; but whether this is a tree or shrub I cannot at present discover, as the person from whom I had my information, had only seen the mode of cutting and using the plant.

The branches being cut into lengths of the intended, or usual breadth of the sheet of rice paper, are placed upon a thick piece of copper, with two raised edges, as guides to keep them steady; and being held in the left hand, are presented to the edge of a large knife, about ten inches long and three inches broad, made very sharp, and held in the right hand.

A slight incision being made in the piece of branch for its whole length, it is kept moving round by the left hand, while the knife is also kept in motion by the right hand, and is thus sliced or pared down from circumference to centre, and then spread out to flatten.

The sheets are usually made up into bundles, of nineteen or twenty pieces each, which weigh about twenty-three ounces, and are sold wholesale for about one dollar a bundle.

The refuse pieces, such as that sent you, are used for making artificia flowers.

It is chiefly brought from the Island of Formosa by the Chinese junks, hence is the difficulty of ascertaining the nature of the plant; as few, if any, of the persons concerned in the sale of the prepared article at Canton have ever seen from what it is made.

To A. Aikin, Esq. Secretary, &c.

Upon this Mr. Gill remarks, we have long been of opinion, from microscopic observations, that the so termed "Chinese *rice paper*," was an organized vegetable production, much resembling in its structure *the pith of elder;* and our opinion is now fully confirmed by Mr. Reeves's letter.

It appears to us, that the two raised edges upon the side of the piece of copper, serve not only as guides to keep the pith steady,

* Correspondent of Edin. Nat. and Geogr. Science.

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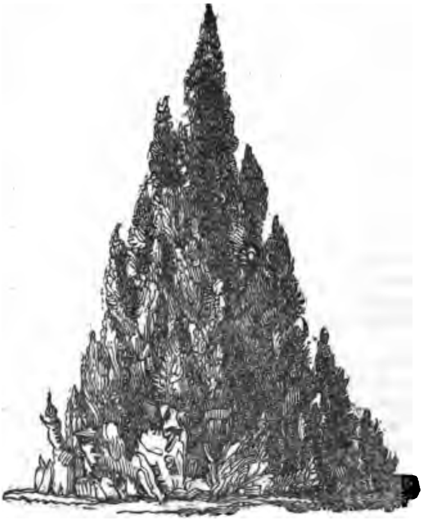
but also *to regulate the thickness of the slices;* the knife lying upon their tops, and the piece of pith being held down upon the bottom of the plate of copper, and gradually turned round and presented to the edge of the knife, whilst it is carried along backwards and forwards; the slice cut will pass underneath the knife, and escape at the front of the plate, and be succeeded in its turn by the remainder of the slice, until the operation is finished.

We have no doubt that cylindrical pieces, either of elder or other pith, might be found in this country, quite large enough to bear slicing in this manner; and which slices, after being flattened by pressure between plates (possibly warmed or heated) might serve as substitutes for the Chinese ones; and be equally capable of receiving any colours as they are. We now see beautiful figures cut out of elder pith, by a skilful hand, exposed for sale in most of our philosophical instrument maker's shops, for electrical experiments; and hope soon to see leaves of it formed in the same manner.*

REMARKABLE SPRUCE FIR.



A BEAUTIFUL tree of the black American spruce (*Abies nigra*,) about forty years old, stands in the woods at Braco Castle, Perthshire, the property of James Masterton, Esq., of Braco; from its side-shoots a number of young trees have sprung up of different altitudes around the mother-plant. The circumference is regularly and gradually extending, and fresh shoots strike root and grow perpendicularly all around the original plant. Should this beautiful assemblage of evergreen spires be allowed to extend, and be protected from the inroads of cattle, it may be difficult to assign limits to the beautiful mass of vegetation which time may form. The above

* From Vol. XLVI. of the Transactions of the Society for the Encouragement of Arts, Manufactures, and Commerce.

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sketch will give some idea of its present appearance. It may be proper to add that a natural seedling from this tree, standing not far distant from the mother-plant, apparently about twelve years of age, is also in its turn already surrounded by a numerous and healthy rising family.*

THE DEAD SEA.

From Madden's Travels.

"About six in the morning I reached the shore, and much against the advice of my excellent guide, I resolved on having a bath. I was desirous of ascertaining the truth of the assertion, that 'nothing sinks in the Dead Sea.' I swam a considerable distance from the shore; and about four yards from the beach I was beyond my depth; the water was the coldest I ever felt, and the taste of it most detestable; it was that of a solution of nitre, mixed with an infusion of quassia. Its buoyancy I found to be far greater than that of any sea I ever swam in, not excepting the Euxine, which is extremely salt. I could lie like a log of wood on the surface, without stirring hand or foot. as long as I chose; but with a good deal of exertion I could just dive sufficiently deep to cover all my body, when I was again thrown on the surface, in spite of my endeavours to descend lower. On coming out, the wounds in my feet pained me excessively: the poisonous quality of the waters irritated the abraded skin, and ultimately made an ulcer of every wound, which confined me fifteen days in Jerusalem; and became so troublesome in Alexandria, that my medical attendant was apprehensive of gangrene."

On the shores of the lake the author found several fresh-water shells, and the putrid remains of two small fish, which he believes to have been carried down by the Jordan, for he is convinced that no living creature is to be found in the Dead Sea. He spent two hours in fishing, but he only caught some bitumen. The face of the mountains and of the surrounding country bore to him all the appearance of a volcanic region, though he confesses he neither found pumice-stone nor genuine black lava. The soil was covered with white porous stone and red-veined quartz. On the mountains on the western side of the lake were large quantities of the stink-stone, the recent fracture of which produces a strong smell of sulphuretted hydrogen. The surface of the water on these shores is covered with a thin pellicle of inflammable asphaltum. This proceeds from fissures in the rock on the opposite beach. After coagulating in the cold air, it cracks in pieces with an explosion, and is drifted over to the western beach. On coming out of the water the author found his body coated with it, and likewise with an incrustation of salt, about the thickness of a sixpence. The rugged aspect of the moun-

* Mag. Nat. Hist.

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tains, the terrible ravines on either shore, the romantic forms of the jagged rocks, all prove that the surrounding country has been the scene of some terrible convulsion of nature. I have no hesitation, adds the author, in saying, that the sea which occupies the sites of Sodom and Gomorrah, Adam, Seboim, and Segor, covers the crater of a volcano; and that, in all probability, heaven made that mode of destruction the instrument of Divine vengeance. A bottle of the water of the Dead Sea, which Mr. Madden brought home with him, was analyzed last winter by Dr. William Gregory, at the London University. The following is his analysis:—

"Chloride of sodium, with a trace of bromine	9.58
Chloride of magnesium - - - - -	5.28
Chloride of calcium - - - - - -	3.05
Sulphate of lime - - - - - - -	1.34
	19.25.

"The most extraordinary circumstance perhaps to be remarked is, that there is no visible outlet to the lake, notwithstanding that the Jordan is continually flowing into it. Dr. Shaw calculates that the Jordan daily sends into the Dead Sea six millions and ninety thousand tons of water, and yet there is never any visible increase or diminution in the height of the water, though Chateaubriand erroneously states that it varies at different periods. Its greatest breadth does not exceed ten miles, and its extreme length is about seventy.

EFFECTS OF THE SULPHURETS OF ARSENIC AND OTHER METALS ON THE ANIMAL SYSTEM.

In order to test the opinion entertained by certain physicians, that sulphuret of arsenic is innocuous, M. Orfila made certain experiments with it which showed clearly its deleterious nature. On applying fifty or sixty grains of the yellow sulphuret of arsenic to the thighs of dogs, these animals suffered in the same manner as by other arsenical preparations, and died in from forty-eight to sixty hours. The native orpiment of Tojova poisoned and caused death in two days. Death was produced in six days by forty grains of native realgar, from Hapnike, in Transylvania. Hence it is shown, that the sulphurets of arsenic, either natural or artificial, and when free from white arsenic, are still poisonous. An ounce of sulphuret of lead, introduced into the stomach of animals, caused no injury. Six gros (354 grains) of sulphuret of copper, given to a dog three months old, caused vomiting of a mucous and glary matter, without affecting the health of the animal. The black and red sulphurets of mercury being well washed were also proved to be innocuous by similar experiments and results; and thus all that has been said of the

deleterious action of these bodies is satisfactorily shown to be erroneous.*

PHOSPHORESCENCE OF THE SEA.

In a paper on the colouring principle of the water of the Baltic, M. Pfaff incidentally makes certain remarks on the phosphorescence which it exhibits, principally at the end of the summer until November. He confirms the opinion that the appearance is due to the presence of microscopic animals, and principally *infusoria*. In support of this opinion, he quotes the careful observations of Dr. Michaelis, who has already determined several species, and noticed the most important circumstances affecting their phosphorescence. M. Pfaff observes, that if an electric current be passed through a tube filled with sea-water recently taken up, there is immediately seen in it an infinity of brilliant points continually in motion, which remain visible only for a few moments. In general all experiments prove that these microscopic animals exhibit their light when acted upon by stimulants such as ammonia, acids, ether, and alcohol. It is also remarked that mechanical pressure produces the same effect upon the water, but that the phosphorescence is rarely perceived with water that is quiescent.†

NATURAL NITROGEN SPRINGS.

Nitrogen gas issues in almost a pure state from the earth on John Bradt's farm, in Hoosick, just within the limits of Rensselaer county, New York. It appears to issue from every part of a low hill, comprising four or five acres of ground; for wherever there is water it bubbles through it. It issues abundantly from the hill through three springs from the clear gravelly bottoms of each. Probably the gas accompanies the water from a considerable depth, for the springs are not influenced by the wet seasons. The underlying rock appears to be sparry limestone, but the detritus here is very deep.‡

NATIVE SULPHURIC ACID.

Professor Eaton has described the natural occurrence of sulphuric acid in large quantities, both in a diluted and a concentrated state, in the town of Byron, Genessee county, ten miles south of the Erie canal. The place has been known in the vicinity, for seventeen years, by the name of the sour springs. The place consists of a hillock 230 feet long and 100 broad, elevated about five feet above the surrounding plain; its greatest extent is north and south; it consists of an ash-coloured alluvion, con-

* Archiv. de Medec. † Bib. Univ. ‡ Silliman's Journ.

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taining an immense quantity of exceedingly minute grains of iron pyrites: it is mostly covered with a coat of charred vegetable matter four or five inches thick, and black as charcoal; the same kind of matter extends on all sides, from the base of the hillock over the plain. Its charred state is caused wholly by the sulphuric acid. Several holes have been dug in the hill, which now contain turbid dilute sulphuric acid; also the depressions on the meadow ground around it. The strength of the acid increases in a time of drought: when Professor Eaton examined it much rain had recently fallen, and the acid was very diluted in most places, but it was strong in some, and appeared to be quite concentrated and nearly dry in the charred vegetable coat. In this state it was diffused through the whole piece of ground, which presented the charred appearance to the depth of twelve or fifteen inches, and in some places three or four feet. But it was every where strongest at the surface.

In wet spring seasons it appeared that adders-tongue, and some other plants, flowered on this hillock sooner than on the adjoining grounds; but as soon as the spring rains began to decline, then the vegetables withered away, and appeared as if scorched.

About two miles east of this place is another sulphuric acid spring, still more remarkable in one respect. The quantity of water from the spring is in sufficient quantity to turn a light gristmill, and yet there is so much sulphuric acid present in it, that the stream will constantly redden violets, and its water coagulate milk. Several other sour springs were mentioned as existing in the neighbourhood,

It is supposed that the sulphuric acid is produced in some way by the decomposition of the pyrites in the soil.*

POLAR RED SNOW.

According to the chemical examination of the red snow brought from the north by Captain Franklin, MM. Macaire Prinsep and Marcet are inclined to think that it may be of animal production and not vegetable, *i. e.* to consist of animals or animalcules. The analogy of this substance to a red matter, taken from the lake of Morat, was one amongst other reasons for this opinion, and also the circumstance that gelatine (containing azote) has not as yet been found in the vegetable creation, whereas it is in this red snow.†

THE SEAL.

The nose of the seal is considered by physiologists to be the most perfect nose belonging to the class of quadrupeds. Sir B. Harwood has computed, that the smelling surface in the nose of a single seal, amounts to the enormous quanty 240 square inches.

* Silliman's Journ. † Bib. Univ.

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RIDING ON THE BACK OF A CROCODILE.

Many people on possessing the original and highly interesting *Wanderings in South America*, by Charles Waterton, Esq., altogether disbelieve his account of catching the crocodile, or, as it is there called, the *Cayman*, and laugh at the extreme improbability of his having "jumped on his back," in order to conquer him. This the greater part of his readers have looked upon as a fiction; and others have considered it as a downright falsehood. The following observations, therefore, will tend to counteract this idea, and to show that it has actually been the custom, among some nations, both in ancient and modern times, to mount on the backs of crocodiles, that these animals may be taken with more facility and safety.

Pliny in his *Natural History*, describes the manner of catching crocodiles, (which is thus translated :—)

"There is a race of men hostile to the crocodile, called Tentyritæ, from an island in the Nile itself, which they inhabit. Their stature is small, but their courage in this practice is wonderful. This beast is terrible to them that flee from him, but runs away from his pursuers, and these men alone dare attack him. Moreover, they swim after him in the river, and mounting on his back, like horsemen, as he opens his jaws to bite, with his head turned up, they thrust a club into his mouth, and holding the ends of it, one in the right hand, and the other in the left, they bring him to shore captive, as if with bridles, and so frightened with their shouts only, that they compel him to disgorge the bodies he had but just swallowed, in order to be buried."

In a rare and very singular book of field sports, containing one hundred and one coloured plates, to which are annexed four

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lines in Latin, descriptive of each subject, *tab*. 88, represents, most probably from this account of Pliny, some men riding on crocodiles, and bringing them to land by means of a pole across their mouths, whilst others are killing the beasts with large clubs. The foregoing sketch is a figure taken from that plate, and the following are the verses (translated.)

"Tentyra, an island of the Nile, in Egypt, is inhabited by an intrepid people, who climb the crocodile's back, and bridling his mouth with a staff, force him out of the river, and slay him."

Dr. Pococke, in his observations on Egypt, mentions a method of taking the crocodile still more like that which our author practised in South America. He says, "they make some animal cry at a distance from the river, and when the crocodile comes out, they thrust a spear into his body, to which a rope is tied: they then let him go into the water to spend himself, and afterwards drawing him out, run a pole into his mouth, and, jumping on his back, tie his jaws together."

Now, Mr. Waterton and his Indians having secured a monster of the Essequibo, by a baited hook fastened to a long rope, "they pulled the cayman," as he describes, "within two yards of me; I saw he was in a state of fear and perturbation; I instantly dropped the mast, sprung up, and jumped on his back, turning half round as I vaulted, so that I gained my seat with my face in a right position. I immediately seized his fore legs, and by main force twisted them on his back; thus they served me for a bridle."

Herodotus relates a different way of catching this animal on the Nile.

"When they have fixed a piece of swine's flesh on a hook, they cast it into the middle of the river; and on the bank they have a live pig, which they beat. The crocodile, hearing the squeaking, goes to the noise; and having seized the flesh, devours it: they then pull him; and when they have dragged him on shore, they first of all fill his eyes with mud; and having done this, he is very easily despatched."

Tab. 87. of Johannes Stradaen's *Huntings*, represents the manner of taking these beasts, as described by Herodotus, and the lines below it are (translated.)

The crocodile of the Nile is taken with a hook baited with a dead pig. The reptile, allured to the shore by the squeaking of a live pig, devours bait and hook, and is overwhelmed with mud and sand.

Although a ride on the back of a crocodile is not likely ever to become very fashionable, as a morning's exercise or amusement, even in this age of the "march of intellect," yet it is seen, from the above authorities, that it really is, and long has been, adopted in the process of killing these monsters of the deep.*

* Mag. Nat. Hist.

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CURIOUS FACT IN THE ECONOMY OF BEES.

When two or three distinct hives are united in autumn, they are found to consume together scarcely more honey during the winter than each of them would have consumed singly, if left separate. In proof of this remarkable result, the author* states a variety of experiments to which he had recourse, and all of which led uniformly to the same conclusion. And, indeed, he shows positively, by a reference to upwards of thirty hives, six of which had their population thus doubled, that the latter do not consume more provisions during winter than a single hive does; and that, so far from the bees suffering from this, the doubled hives generally send forth the earliest and best swarms.

BLACK GAME

Have increased greatly in the southern counties of Scotland and north of England within the last few years. It is a pretty general opinion, though an erroneous one, that they drive away the red grouse; the two species require a very different kind of cover, and will never interfere.†

BIRDS OF PREY.

All birds of prey are capable of sustaining the want of food and water for long periods, particularly the latter, but of which they also seem remarkably fond, drinking frequently in a state of nature, and during summer washing almost daily.‡

PIGMY TRIBES.

The smallest mammiferous animal yet known is the minute shrew, (*sorex exilis*) which weighs but half a drachm; the smallest animal of the stag kind is the pigmy musk, the legs of which are but two or three inches long, and no thicker than a tobacco-pipe; and the smallest of birds is the trochilus minimus, a species of humming-bird, which weighs, when dried, no more than thirty grains.§

ENGLISH HEADS.

Comparative estimate respecting the dimensions of the head of the inhabitants in several counties of England.

The male head in England, at maturity, averages from 6¾ to 7 5-8th in diameter; the medium and most general size being 7 inches. The female head is smaller, varying from 6 3-8th to 7, or 7¼, the medium male size. Fixing the medium of the English

* Of the Bee Perserver. † Note to White's Selborne, by Sir W. Jardine.
‡ Ibid. § Mech. Mag.

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head at 7 inches, there can be no difficulty in distinguishing the portions of society above from those below that measurement.

London.—The majority of the higher classes are above the medium, while amongst the lower it is very rare to find a large head.

Spitalfields Weavers have extremely small heads, 6½, 6 5-8th, 6¾, being the prevailing admeasurement.

Coventry.—Almost exclusively peopled by weavers, the same facts are peculiarly observed.

Hertfordshire, Essex, Suffolk, and *Norfolk,* contain a larger portion of small heads than any part of the empire; Essex and Hertfordshire, particularly. Seven inches in diameter is here, as in Spitalfields and Coventry, quite unusual—6 5-8th and 6½ are more general; and 6 3-8th, the usual size for a boy of six years of age, is frequently to be met with here in the full maturity of manhood.

Kent, Surrey, and *Sussex.*—An increase of size of the usual average is observed; and the inland counties in general, are nearly upon the same scale.

Devonshire and *Cornwall.*—The heads of full sizes.

Herefordshire.—Superior to the London average.

Lancashire, Yorkshire, Cumberland, and *Northumberland,* have more large heads, in proportion, than any part of the country.

Scotland.—The full-sized head is known to be possessed by the inhabitants; their measurement ranging between 7¾ and 7½ even to 8 inches; this extreme size, however, is rare.*

LAKE ERIE.

THE height of Lake Erie above the Atlantic Ocean, has been ascertained to be 565 feet. The barrier which contains it is so low, that, were it only to rise six feet, it would inundate, on its northern and western borders, seven millions of acres, now partly occupied by towns, villages, and farms; and it is estimated that a further rise of six or eight feet would precipitate a vast flood of waters over the state of Illinois, from the south end of Michigan; the great Canadian Lakes then discharging also into the Mexican Gulf.†

INTERESTING QUESTION.

WHETHER in the sea there be depths where no creature is able to live, or whether a boundary be assigned to organic life within those depths, cannot be ascertained. It, however, clearly appears from the observations made by Biot, and other naturalists, that fishes, according to their different dispositions, live in different depths of the ocean.‡

* Lit. Gaz. † Brande's Journ. ‡ From the German.

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SUPPOSED EXISTENCE OF ACTIVE MOLECULES IN MINERAL SUBSTANCES.

In a communication to the Magazine of *Natural History*, Mr. Bakewell throws doubts on the supposed existence of active molecules in inorganic matter, as propounded by the eminent naturalist, Mr. Brown. With regard to these active molecules, though, in some instances, Mr. Bakewell was at first persuaded that he had seen the motions of the molecules similar to those of the smallest species of Infusòria, a more careful examination proved that he was mistaken, and that the motions were derived from causes that had not been properly appreciated. These motions Mr. Bakewell describes as arising generally from animalcules in the water used in the experiment, from external vibratory motion, very difficult to be guarded against, and the effects of which, in London, it is scarcely possible to avoid, and from currents of air, which the observer's breath is sufficient to produce. As to London dust, the whole of which Mr. Brown asserts is composed of active molecules, Mr. Bakewell says he is fully convinced that the activity of its particles in a drop of water, as well as when dancing in the sunbeam, is derived from external agitation. Mr. Bakewell, however, acknowledges the obligation which the philosophical world are under to Mr. Brown for having directed the attention of naturalists to this subject; and further says that "about ten years ago, Mr. Bywater an ingenious optician, now residing in Liverpool, was reported to have discovered moving animalculæ in coal-ashes, pounded marble, and other mineral substances." Little interest was then excited by the supposed discovery; it required an eminent naturalist like Mr. Brown, whose merits are well known and highly appreciated in his own country and on the continent, to direct public attention to statements so much at variance with our preconceived notions of matter. If, contrary to expectation, after all due caution in the observations, it should be finally established that mineral substances are composed of active molecules, what new views of nature will the discovery unfold! Beds of siliceous sand, like those on our Hampstead Heath, are only awaiting a further process of trituration, to be awakened into life by the torrent that shall bear them into the ocean; and the geologist, while he contemplates the organic remains of a former world imbedded in solid rocks, must regard the rocks themselves as the parents of future living beings. Mr. Brown's discovery is, that the ultimate particle he can obtain from all bodies, organic or inorganic, has inherent motion, like unto vital action. His ideas on the subject, with an account of the microscopical observations which led to them, are set forth in an unpublished pamphlet, a review of which may be found in the abovementioned Magazine. Mr. Bakewell reports that, on repeated observations on several mineral and inorganic substances, he had not discovered any

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proper motion of the molecules, if the water had been recently boiled: he attributes the apparent motion in unboiled water to animalcules previously existing in the water.*

WILD BULLS.

In the province of San Martin, in South America, M. Roulin, saw wild bulls feeding in the *llanos* among domestic cattle. These animals pass their morning in the woods, which cover the foot of the Cordillera, and come out only about two in the afternoon to feed in the savanna. The moment they perceive a man they gallop off to the woods.†

LARGE MOTH.

A person at Arracan has caught a moth, which measures from the tip of one wing to the tip of the other, ten inches. Both wings are beautifully variegated with the brightest colours. Unless we are mistaken, this is the largest moth upon record, exceeding in dimensions the largest in the British Museum, which, we believe, measures about nine inches from tip to tip.‡

LOCH LOMOND.

Mr. Galbraith has recently determined the quantity of water annually discharged by the river Leven from the basin of Loch Lomond to be about 59,939 cubic feet per minute. Now, as 36 cubic feet of fresh water are very near equal to a ton, this gives 1,665 tons per minute; and, supposing the year to be 365 days, 5 hours, 49 minutes, the annual discharge at that rate, will be 877,925,085 tons. But as the river was rather below its average height, one-third may be added to this result; and we have about 1,200,000,000, or twelve hundred millions of tons per annum.

THE ATTACHMENTS FORMED BY ANIMALS,

From living together, have produced several remarkable facts. Feeling has been evinced by those reckoned most insensible, and even the strongest laws of nature have been set a side. The cobra di capello and the canary bird, who for years inhabited the same cage at Mr. Cross', in Exeter Change, are strong instances of the latter; but this communication more particularly alludes to the former.

When I lived in Paris, says Mrs. Bowdich, there were two remarkably fine ostriches, male and female, kept in the Rotunda of the Jardin du Roi. The skylight over their heads having been broken, the glaziers proceeded to repair it, and, in the course of

* London Mag. † Jameson's Journ. ‡ Madras Paper.

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their work, let fall a triangular piece of glass. Not long after this, the female ostrich was taken ill, and died after an hour or two of great agony. The body was opened, and the throat and stomach were found to have been dreadfully lacerated by the sharp corners of the glass which she had swallowed. From the moment his companion was taken from him, the male bird had no rest; he appeared to be incessantly searching for something, and daily wasted away. He was moved from the spot, in the hope that he would forget his grief; he was even allowed more liberty, but naught availed, and he literally pined himself to death. I heard of a curious expedient the other day, which prevented a similar catastrophe: near the old road between Bristol and Gloucester. A gentleman residing in this country, had for some years been possessed of two brown cranes; one of them at length died, and the survivor became disconsolate. He was apparently following his companion, when his master introduced a large looking-glass into the aviary. The bird no sooner beheld his reflected image than he fancied she for whom he mourned had returned to him; he placed himself close to the mirror, plumed his feathers, and showed every sign of happiness. The scheme answered completely, the crane recovered his health and spirits, passed almost all his time before the looking-glass, and lived many years after, at length dying from an accidental injury.*

UNIVERSAL LANGUAGE.

M. BURGER of Heidelbergh, well known by his mathematical works, has announced a system of universal language, by which a correspondence may be kept up, on easy and certain principles, by individuals of all nations, although totally unacquainted with each other's native language. The acquisition of the system will scarcely require two days.†

INSENSIBILITY OF THE HUMAN BODY TO PAIN.

THE following incident, which occurred a few years back at one of our lime-kilns, manifests how perfectly insensible the human frame may be to pain in peculiar circumstances. A travelling man one winter's evening laid himself down upon the platform of a lime-kiln, placing his feet, probably numbed with cold, on the heap of stones newly put on to burn through the night. Sleep overcame him in this situation; the fire gradually rising and increasing until it ignited the stones upon which his feet were placed. Lulled by the warmth, he still slept; and though the fire increased until it burned one foot (which probably was extended over a venthole) and part of the leg, above the ancle, entirely off, consuming that part so effectually, that no fragment of it was

* Correspond.—Mag. Nat. Hist. † Foreign Rev.

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ever discovered, the wretched being slept on! and in this state was found by the kiln-man in the morning. Insensible to any pain, and ignorant of his misfortune, he attempted to rise and pursue his journey, but missing his shoe, requested to have it found; and when he was raised, putting his burnt limb to the ground to support his body, the extremity of his leg bone, the tibia, crumbled into fragments, having been calcined into lime. Still he expressed no sense of pain, and probably experienced none, from the gradual operation of the fire and his own torpidity during the hours that his foot was consuming. This poor drover survived his misfortunes in the hospital about a fortnight; but the fire having extended to other parts of his body, recovery was hopeless.*

THE TEA PLANT.

THE cultivation of tea is not general throughout the Chinese empire; the northern parts being too cold, and the southern parts too warm. The plant is the growth of a particular region, situated between the thirtieth and thirty-third degrees of north latitude, called the tea-country, *Tok-yen*, *Ho-ping*, *An-koy*, &c. There are some plantations near Canton, but they are few, and those that do exist are of no great extent. The trees are planted four or five feet asunder; they have a very stunted appearance; and they are not allowed to grow higher than is convenient for men, women, and children, to pick the leaves. The gatherings take place from one to four times in each year, according to the age of the plant. It is only the difference in the times of gathering, and manner of curing, which causes the distinction in appearance, qualities, and value; those which are gathered earliest in the spring, make the strongest and most valuable tea, such as pekoe, souchong, &c.; the inferior, such as congou, bohea, are of the latest gatherings, green or hyson can be made of any of the gatherings, by a different mode of drying. The first gathering of the leaves begins about the middle of April, and continues to the end of May; the second lasts from Midsummer to the end of July; the third takes place during the months of August and September. When the leaves are gathered, they are put into wide shallow baskets, placed on shelves in the air, or wind, or mild sunshine, from morning till noon; then on a flat cast-iron pan, over a charcoal stove, ten or twelve ounces of the leaves are thrown at a time, stirred quickly with a short hand-broom twice or thrice, and then brushed off again into the baskets, in which they are equally and carefully rubbed between men's hands to roll them; after which, they are again put into the pan in larger quantities, over a slower fire, to be dried a second time. When fired enough, the tea is laid on tables, to be drawn or

* Journal of a Naturalist—one of the most delightful books of the past year, and worthy of place beside White's *Se borne*.

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picked over, putting aside all the unsightly and imperfectly dried leaves, in order that the sample may be more even and marketable. To make singlo or hyson, the first two gatherings are chosen, and, as soon as picked from the trees, are put into the pan; next rolled and spread thin, to separate the leaves, which adhere to each other; again well dried, spread, sifted, picked, and fired two or three times more (especially if it is damp weather), before it is in a marketable state.

The Chinese drink their tea without either milk or sugar; they partake of it plentifully at their meals, and very frequently in the course of the day. One mode of using it, among the higher ranks, is formed by grating into the cup, balls made of the most valuable leaves, cemented together by some kind of tasteless gum.*

THE MANITA TREE,

So named from the resemblance of its flowers to a little hand, (manita) is a species of plant almost unknown in the catalogues of botanists. It is sometimes supposed that only three specimens are in existence; two in the small botanical garden at the palace of the city of Mexico, and one at the town of Toluca. It is certain that nobody in Mexico can tell whence they originally came, or where they may be found growing in a wild state; but as they were preserved with many other foreign productions by the emperor Montezuma, it is imagined either himself or his ancestors must have obtained them from the interior of South America. The tree is about forty feet high, with a smooth trunk, without branches almost to the top; but the boughs then stretch over a considerable distance, with large leaves and numerous flowers hanging downwards from amongst the foliage. It bears a stronger resemblance to the plane or the tulip-tree, than any others we are acquainted with in Britain. Two of this species were found by the Spaniards at the time of their conquest, and form a solitary exception to the devastations of those adventurers; most probably because Cortez occupied the site of the palace for his own residence, and therefore coveted the shade of its garden; the smaller plant now growing at Mexico is considered to have been a sucker from the other. Tradition states, that though the Indians did not actually worship the manita tree, yet they regarded the flower with a sort of religious veneration.†

THE BARBERRY.

This tree is a native originally of the eastern countries, though it is now found in most parts of Europe, where it thrives best upon light and chalky soils. It grew formerly wild, in great quantities, in the hedgerows of England, but has been universally banished, from a general belief that its presence is injurious to the growth of corn. Duhamel, Broussonnet, and other scien-

* Gardener's Magazine. † Mexican Illustrations.

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tific writers, treat this belief as a vulgar prejudice. It should, however, be remarked, that the fructification of the barberry is incomplete unless the stamens be irritated by insects when the filaments suddenly contract in a most remarkable manner towards the germ. The flowers are, therefore, by a beautiful arrangement of nature, peculiarly attractive to insects; and thus the barberry may become injurious to neighbouring plants.*

PRESERVATION OF TREES IN WINTER.

In iron founderies, such as the foundery for cannon at Munich, it is customary to stir the melted metal with a branch of green oak; and notwithstanding the great heat of the metal, the green wood is not affected deeper than about the twentieth part of an inch. This striking fact is explained from the non-conducting power of the sap; and upon the same principle it is that the bodies and branches of trees, not having the covering of snow which the roots have, are protected from the operation of cold by their sap increasing in spissitude, and, of course, in non-conducting capacity, as the winter approaches. On similar principles we may account for the preservation of various kinds of fruits.†

ANTI-CORROSIVE WOOD.

The hemlock tree has been found to possess the remarkable property of preserving iron inserted in it from corrosion, even when under water.

OCEAN WOOD

Is the name of a new species of wood which has been lately used by Mr. Tomkison, in the manufacture of pianofortes. It is a sort of mahogany, and its name is supposed to have been given, from a fancied resemblance its grain presents to the undulation of the sea. It is quite an unique in the English market, and for a single log Mr. Tomkison is said to have paid the enormous sum of 2,300 guineas.‡

AMERICAN ALOE.

The sharp-pointed leaves of the American aloe have been known to inflict serious injury. In the *Lancet*, No. 313, vol ii., a case is recorded of a young gardener, who whilst watering some plants in a gentleman's garden, at Camberwell, accidentally struck his hand against an aloe plant, one of the prickles of which passed into the last joint of his lefthand little finger; he regarded the

* Lib. Enter. Knowledge.—*Fruits*. † Mr. Rennie, in Mag. Nat. Hist.
‡ Mechanic's Magazine.

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circumstance at the time as but of trifling consequence, on account of its causing him but slight inconvenience; neither were the effects worth notice until two days after the accident, when the part put on a white appearance, and the finger became very stiff, swollen, and painful; these symptoms increased, and by the following morning the whole hand and arm, as far as the elbow, had attained an exceedingly large size. After suffering about two months, the poor fellow was removed into St. Thomas's Hospital, where the diseased arm was amputated by Mr. Travers, and the patient soon recovered his accustomed good health.*

LAND CRABS.

In the forests of Guam, more than a mile from the shore, MM. Quoy and Gaimard found a very large species of *Pagùra*, with violet claws, lodged in the shells of *Búccina*, and covered with an earthy crust, which appears to be their constant abode. Some of these *Pagùræ* had the faculty of emitting a sort of froth when they were irritated. They were attracted by light; for one night, when encamped on shore, the sailors lighted a fire, and a large *Pagùra* came towards it from a considerable distance, and became the victim of his curiosity, being cooked in his own house, and afterwards devoured.

It appears that there are two divisions of this tribe; one living on land, the other in water; the marine species being distinguished by rounded eyes, set upon the extremities of long cylindric peduncles. The land species, on the approach of danger, always retreat, either into accidental crevices or holes, or preferably under the roots or into the hollow trunks of trees; never, or at least rarely, into the sea, though it be near them.†

NEW SHEATHING FOR SHIPS.

It is stated in accounts from Van Dieman's Land, that a 74-gun ship is now building there of teak, and that it is to be sheathed with sheets of India rubber, which it is supposed will be not only impervious to water, but wholly free from any liability to foulness or corrosion.‡

USE OF THE LEAVES OF THE TALIPOT.

All books of importance in Pali and Cingalese, relative to the religion of Buddhoo, in Ceylon, are written on lamina of the leaves of the Talipot, or *Córypha umbraculífera*. The Pali and Cingalese character is engraved upon them with either a brass or an iron style. There are some of these books in Sir Alexander Johnston's collection, which are supposed to be between five hundred and six hundred years old, and which are still very perfect.

* Mirror. † Mag. Nat. Hist. ‡ Mechanic's Mag.

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This leaf is used in the maritime provinces of Ceylon as a mark of distinction, each person being allowed to have a certain number of them folded up as fans, carried with him by his servants; and also, in the Kandian country, in the shape of a round, flat umbrella, on a long stick. It is, moreover, used in making tents. Sir Alexander Johnston gave a very fine specimen of a tent made of these leaves, large enough to hold a party of ten persons at table, to the late Sir Joseph Banks, in 1818. These leaves are also used by the common people to shelter themselves from the rain, one leaf affording sufficient shelter for seven or eight persons: *

ROSES.

A curious work has lately been published at Paris, entitled "*Rosetum Gallicum;*" or a methodical enumeration of the species, and varieties of the genus, *Rosier;* either indigenous in France, or cultivated in gardens. The following list of some of the most interesting of the species, amounting to seventy-nine in all, will give an idea of the great number of varieties:

Species.	Varieties.	Species	Varieties.
Rosier mousseux	18	Rosier de Damas	117
——— de chien	20	——— cent feuilles	121
——— des Alpes	21	——— pimprenelle	123
——— de Francfort	30	——— blanc	125
——— thé	42	——— de Bengal	254
——— rubigineux	57	——— de Provins	1215
——— noisette	89		

HOAR-FROST.

Dr. Murray, in a paper on the *Natural History of Alford,* says—"I doubt, however, whether the state of the ground as to moisture has any material influence over the hoar-frost, and am rather disposed to explain all the circumstances upon the principles laid down by Dr. Wells and others, as regulating the formation of dew and hoar-frost. In a cloudless and perfectly calm night, the earth throws off the heat it had received during the day, in such a manner, that its surface, as well as the air, for several feet upwards, becomes often 10 deg. or 12 deg., and sometimes 15 deg. colder than the rest of the atmosphere; and the formation of dew, or hoar-frost, naturally takes place.—Farther, it is known that a flat or horizontal surface loses more heat, and therefore becomes more loaded with dew or hoar-frost, than a similar surface, placed vertically, or with an inclination. In short, it is established, that a clear sky, a dead calm, and a horizontal surface, are the circumstances most favourable—the two first being perhaps absolutely necessary—to the formation of dew or hoar-frost.†

* Gardener's Mag. † Jameson's Journ.

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ORIGINAL OF THE CAT AND DOG.

In Rüppell's interesting Atlas to his Travels in Northern Africa, we find a description of several new species of cat and dog. Of the genus *Felis*, two species are figured and described: the *F. maniculata* and *F. chaus*, Lüld. For the discovery of the former of these, we are indebted to M. Rüppell, *who regards it as the original stock from which the domestic cat of the Egyptians was derived, and whence probably also sprung the house cat of Europe.* In this opinion he has been followed by M. Temminck. The character of the species, as given by Dr. Cretzschmar, is as follows:—"*Felis* colore griseo-ochraceo; genis colloque antico albis, hoc lineis ochraceis duabus cincto; planta pedum, metacarpi et metatarsi parte posteriore nigris ; cauda gracili, æquali, ad apicem annulis nigris duobus." It was obtained in Nubia, on the western side of the Nile, at Ambukol. Not less than seven species of *Canis* have been collected by M. Rüppell, the whole of which are here figured and described. Of these we shall mention two: *Canis famelicus*. "*Canis* capite ochraceo; fascia dorsali castanea; corpore supra ex griseo-flavescente, infra ex subflavo-albescente: auriculis permagnis erectis." This character is derived from the examination of seven specimens, collected partly in the deserts of Nubia, and partly in Kordofan. The species is nearly related to the Fennec, which it resembles also in its habits. It is probably the fox-like animal represented on the monuments of ancient Egypt; as the jackall, *Canis aureus*, Linn. does not appear to exist there, or in the immediately adjoining countries. *Canis Anthus*, F. Cuv. "*Canis* capite crassiore; auriculis erectis, curtis; gutture et collo infra, sordide albidis; corpore supra ex fulvo, albido, nigro et ochraceo vario, infra albido; cauda nigra, basi tantummodo inferne albido; pedibus ex fulvo ochraceis." This differs in some respects from the figure given by M. F. Cuvier; but M. Temminck, who has seen both specimens, considers them as belonging to the same species. It may be regarded as the wolf of Egypt and Nubia, where it is very rare, and resembles in the colour of its fur the European wolf. *Dr. Cretzschmar appears disposed to believe, that from it is sprung the now widely diffused house-dog.**

ON THE PRICKLE IN THE TAIL OF THE LION.

Two lions, which died some months ago in the menagerie of the King's Garden at Paris, have furnished an occasion of verifying a curious fact, mentioned in some old works, but which modern authors have generally omitted. It is, that there exists at the extremity of the lion's tail a small claw, concealed in the midst of the tuft of long black hairs which occurs there. It is a horny production, about two lines in length, which presents itself un-

* Jameson's Journal.

der the form of a small cone a little curved, and adhering by its base to the skin only, and not to the last vertebra, which is separated from it by a space of two or three lines. This small claw exists in both sexes. The commentators of Homer thought they could explain, by the presence of this claw, a curious and correct remark made by the author of the Iliad—which was, that the lion is the only animal which, when irritated violently, agitates its tail, and strikes its sides with it. They imagined that the lion sought to excite himself by pricking his sides with the horny production in question. Blumenbach, some years ago, verified the existence of this prickle; but the pamphlet in which his observations were contained has remained unnoticed by naturalists; and the curious fact of which we speak might long have remained unknown, had not M. Deshayes happened to see the pamphlet in question, and engage the naturalists who more particularly study the department of mammalogy, to make some observations on the subject. This prickle, or spur, adhering only to the skin by the circumference of its base, is very easily detached. In general, no traces of it remain in stuffed individuals. It has not yet been observed whether it exists equally in the other large species of the genus Felis.*

THE SHARK.

Mr. De Kay read in the Lyceum of Natural History, York, a description of a large species of squalus (shark), lately captured on the American coast. The author observed, that the first description of the S. maximus were so imperfect, that modern naturalists have considered it a doubtful species, and have accordingly described several large individuals of this genus as new species. Dr. De Kay considers the *S. pelerin*, *S. gunnerianus*, *S. homianus*, *S. elephas*, and *S. rhinoceros*, as all belonging to the *S. maximus*, to which also he refers the individual under consideration. The *S. peregrinus*, Pinna anali nulla, is certainly a distinct species. The most striking peculiarity observed in this specimen, was the presence of true baleen. Each branchial opening was furnished with a fringe of baleen four inches in length. This was composed of a great number of distinct flattened fibres, a tenth of an inch wide at their origin, and tapering gradually to minute threads at their extremities. In colour, texture, and flexibility, this resembles very much the baleen of the Balæna mysticetus. The liminæ are extremely regular in their position: thirty of them are included within the space of an inch, and they extend the whole length of the branchial apertures. The author concluded by remarking, "That all inferences respecting the size of a shark, founded on the magnitude of the fossil teeth alone, must be erroneous, as the individual just men-

* Jameson's Journal.

tioned was twenty-eight feet long, and its teeth were only half an inch in length. There are fossil sharks' teeth in the cabinet of the Lyceum four inches long, which, by parity of reasoning, belonged to an animal 220 feet in length.*

NOTICE OF A PIGEON

Which continued to live two days without Brain and upper part of Spinal Marrow.

M. Desportes, a physician, lately sent to the Academy of Science of Paris, an account of an observation in which he saw a young pigeon live for two days in its shell, of which it could not rid itself, as well as some time after, although the brain and upper part of the spinal marrow were wanting. The author of the letter, deceived by the accounts given in some journals, had imagined this observation to be in contradiction to what M. Flourens had announced with respect to the influence of the spinal marrow upon respiration. M. Flourens remarked, that the important fact observed by the author is in no degree opposed to the inferences deducible from his experiments.†

THE SPRAT NOT THE YOUNG OF THE HERRING AND PILCHARD.

Mr. Yarrell remarks, that on comparing a sprat with a young herring of the same length, the sprat will be found to be considerably deeper, and the scales much larger; in this latter circumstance the sprat resembles the pilchard; but the pilchard, on the other hand, is not so deep a fish as the herring. The sprat and herring differ also in the number of rays in three of the fins out of the four they possess, and also in the tail, as the following numbers exhibit:

	Dors.	Pect.	Vent.	An.	Caud.
Sprat - -	17	15	17	18	19
Herring - -	17	14	9	14	20

There is also one other most material difference—the vertebræ in the sprat are 48 in number; in the herring there are 56.‡

MORTALITY AMONG LEECHES DURING STORMS.

That atmospheric changes have a remarkable influence upon leeches is a well-established fact. In 1825, M. Derheims, of St. Omer, ascribed the almost sudden death of them at the approach of, or during storms, to the coagulation of the blood of these creatures, caused by the impression of the atmospheric electricity. This opinion, which at that time was the result of theory, he confirmed, in the month of March last, by direct experiment.§

* Silliman's Journal. † Jameson's Journal.
‡ Zoological Journal. § Bulletin Univ.

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WHITE BAIT NOT THE YOUNG OF THE SHAD.

MR. YARREL has shown that the white bait is not the young of the shad, or Clupea alosa; but a well-marked and distinct species, which he names Clupea alba. We have now five British species of clupea. viz.—1. Cl. Harengus (Herring); 2. Cl. Pilcardus (Pilchard); 3. Cl. alba (White Bait); 4. Cl. Aloso (Shad or Mother of Herrings); Cl. Spratus.*

CAPRIFICATION.

TOURNEFORT, in his Travels, mentions that, in Provence, the maturation of figs was hastened by pricking them at the open end with a straw dipped in olive oil. Colonel Thackery informs us that a similar practice prevails at Malta, and at other places in the Mediterranean; and he adds, what is of some importance in so precarious a climate as ours, that he has successfully followed the practice in Scotland.†

VOCAL SOUNDS AFTER DEATH.

M. MAINGAULT states that, in experiments made by the larynxian tube, he had occasion to observe a phenomenon noticed by M. Dutrochet—namely, that when air was forcibly thrown into the lungs of a dead infant or animal, the air, when thrown out again through the larynx, produced a sound analogous to that produced by the infant or animal in the living state.‡

THE GREAT AMERICAN BITTERN.

I was much interested with an account I heard the other day of a bird, a species of heron: I believe, called by Wilson, in his *Ornithology*, the Great American Bittern; but, what is very extraordinary, he omits to mention a most interesting and remarkable circumstance attending it, which is, that it has the power of emitting a light from its breast equal to the light of a common torch, which illuminates the water so as to enable it to discover its prey. As this circumstance is not mentioned by any of the naturalists that I have ever read, I had difficulty in believing the fact, and took some trouble to ascertain the *truth*, which has been confirmed to me by several gentlemen of undoubted veracity, and especially by Mr. Franklin Peale, the proprietor of the Philadelphia Museum.§

FRENCH EGGS AND APPLES.

63,109,618 hen's eggs, and 14,182 bushels of apples, were imported from France into England in the year 1827.

* Zoological Journ. † Jameson's Journ. ‡ Brande's Journ.
§ Letter from Philadelphia, Oct. 11, 1828.—Mag. Nat. Hist.

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THE GIRAFFE AT PARIS.

The great attraction—the queen of the Garden of Plants, at Paris—is the Giraffe. She is the only survivor of the three which left Africa much about the same time, and inhabits the large round building in the centre of the menagerie, called the Rotonde. Great care is taken to shelter her from the cold, and in the winter she has a kind of hood and cape, which reach the length of her neck, and a body cloth, all made of woollen materials. She is only suffered to walk in her little park when the sun shines upon it; and if care and attention can compensate for the loss of liberty, she ought to be the happiest of her kind. She stands about 12½ feet high; and her skin, with its light brown spots, shines like satin. She looks best when lying down, or standing perfectly upright, in which posture she is very dignified; but the moment she moves she becomes awkward, in consequence of the disproportion of the hinder parts of her body, and the immense length of her neck, which, instead of being arched, forms an angle with her shoulders. When she gallops, her hind feet advance beyond those in front, and the peculiarity of gait caused by moving the hind and fore feet on the same side, at the same time, is very striking. She has great difficulty in reaching the ground with her mouth, and was obliged to make two efforts to separate her fore legs before she could reach a cistern placed on the pavement. Her head is of remarkable beauty, and the expression of her full black eyes is mild and affectionate: her tongue is long, black, and pointed. She is extremely gentle, yet full of frolic and animation; and when walking in the menagerie her keeper is obliged to hold her head, to prevent her biting off the young branches of the trees. Her great delight, however, is to eat rose leaves, and she devours them with the greatest avidity. The African cows, with humps on their shoulders, who supplied her with milk during her passage to Europe, are as gentle as their nursling, and when feeding her they come and softly push your elbows to have their share. Turning from the giraffe one day, and proceeding a yard or two in order to satisfy them (says Mrs. Lee), I suddenly felt something overshadow me, and this was no less than the giraffe, who, without quitting her place, bent her head over mine, and helped herself to the carrots in my hand. Her keeper, named Ati, and from Darfûr, is a tall well-proportioned black; and at his own request a little gallery has been erected for him in the stable of his charge, where he sleeps and keeps all his property.*

WINTER QUARTERS OF FROGS.

The following fact relative to this subject may, perhaps, be acceptable. In draining a bog or springy piece of ground in the

* Mag. Nat. Hist.

winter 1813-14 (during the frost), I discovered a large quantity, some hundreds I suppose, embedded about three feet below the surface, in the head or source of a more than usually strong spring. Upon being uncovered, they appeared very inactive, but not torpid or motionless, and attempted to bury themselves again in the sand, which, from the flowing of the water, was so easily separated as to admit a pole of considerable length to be run down it with a slight pressure. The cavity in which they were, and which apparently was formed by them, was so placed that the water of the spring flowed through it, and prevented their feeling the effects of the frost. In cleaning ditches or stagnant ponds during the winter, I have never seen any but at the bottom of ponds, in which, I am told, they are common. Are we not to infer from this, that they instinctively seek springs, as the water is less liable to freeze; and, as they were in the instance mentioned capable of moving, that they do not hybernate or become torpid during the winter, but that they respire in water, or in their hiding places? I have never observed them in ditches or pools until near their spawning time, viz. after a few warm days in February or March, when their "*croaking* is considered the precursor of spring and provocative of sport" to boys; after which the embryo frogs appear as black spots in a large mass of gelatinous matter.*

THE FLYING LEECH

Is common in the jungles in the interior of Ceylon; and the native troops, on their march to Canely, suffered very severely from their bite, occasionally even to the loss of life or limb: their legs were covered with them, and streamed with blood. I saw one of these animals in a horse's leg. It is much smaller than the common leech, the largest, when at rest, being not more than half an inch long, and may be extended till it becomes a fine string—the smaller ones are very minute. They possess the power of springing, by means of a filament, to a considerable distance.†

ZOOLOGICAL WEATHER GLASS.

The editor of the *Magazine of Natural History*, in his Notes during a recent tour on the continent, says, "at Schwetzingen, in the post-house, we witnessed, for the first time, what we have since seen frequently, an amusing application of zoological knowledge, for the purpose of prognosticating the weather. Two frogs, of the species Rana arborea, are kept in a crystal jar, about 18 inches high, and 6 inches in diameter, with a depth of three or four inches of water at the bottom, and a small ladder

* Correspondent—Mag. Nat. Hist. † Heber's Narrative.

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reaching to the top of the jar. On the approach of dry weather. the frogs mount the ladder; but when moisture is expected, they descend into the water. These animals are of a bright green, and in their wild state here, climb the trees in search of insects, and make a peculiar singing noise before rain. In the jar they get no other food than now and then a fly; one of which we were assured, would serve a frog for a week, though it will eat from six to twelve in a day if it can get them. In catching the flies put alive in the jar the frogs display great adroitness."

THE BAYA; OR, INDIAN GROSSBEAK.

This extraordinary little bird, called Baya in Hindu, Berbera in Sanscrit, Babui in the dialect of Bengal, Cibu in Persian, and Tenawhit in Arabic, from his remarkable pendant nest, is rather larger than a sparrow, with yellow-brown plumage, a yellowish head and feet, a light-coloured breast, and a conic beak very thick in proportion to his body. This bird is exceedingly common in Hindustan: he is astonishingly sensible, faithful, and docile, never voluntarily deserting the place where his young were hatched, but not averse, like many other birds, to the society of mankind, and easily taught to perch on the hand of his master.

In a state of nature he generally builds his nest on the highest tree he can find, especially on the palmyra, or on the Indian fig-tree, and he prefers that which happens to overhang a well or a rivulet; he makes it of grass, which he weaves like cloth, and shapes like a large bottle, suspending it firmly on the branches, but so as to rock with the wind, and placing it with its entrance downwards to secure it from birds of prey. His nest usually consists of two or three chambers; and it is the popular belief that he lights them with fire-flies, which he catches alive at night and confines with moist clay or cow-dung. That such flies are often found in his nest, where pieces of cow-dung are also stuck, is indubitable; but as their light could be of little service to him, it seems probable that he only feeds on them. He may be taught with ease to fetch a piece of paper, or any small thing, that his master points out to him; it is an attested fact, that if a ring be dropped in a deep well, and a signal given to him, he will fly down with amazing celerity, catch the ring before it touches the water, and bring it up to his master with apparent exultation; and it is confidently asserted, that, if a house or any other place be shown to him once or twice, he will carry a note thither immediately on a proper signal being made. One instance of its docility I can myself mention with confidence, having often been an eye-witness of it; the young Hindu women at Benares, and in other places, wear very thin plates of gold, called ticas, slightly fixed, by way of ornament, between their eye-brows; and, when they pass through the streets, it is not uncommon for the youth-

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ful libertines, who amuse themselves with training Bayas, to give them a sign which they understand, and send them to pluck the pieces of gold from the foreheads of their mistresses, which they bring in triumph to the lovers.

The baya feeds naturally on grasshoppers and other insects, but will subsist, when tame, on pulse macerated in water. His flesh is warm and drying, of easy digestion, and recommended in medical books as a solvent of stone in the bladder or kidneys; but of that virtue there is no sufficient proof. The female lays many beautiful eggs, resembling large pearls; the white of them, when they are boiled, is transparent, and the flavour of them is exquisitely delicate. When many bayas are assembled on a high tree, they make a lively din, but it is rather chirping than singing; their want of musical talents is, however, amply supplied by their wonderful sagacity, in which they are not excelled by any feathered inhabitants of the forest.*

THE CAT-FISH.

The author of *Military Memoirs* relates, "while fishing in the Parana river one day I caught a cat-fish. It was armed with two bony substances, not unlike a saw, except that each horn had notches or teeth contrary ways. In order to kill it I gave it a kick, when the creature struck one of these weapons through my boot into my foot, which, notwithstanding that I forced it out, gave me such excruciating pain as caused me to faint."

THE TREATMENT OF THE DROWNED.

As much harm is sometimes done in cases of drowning, before medical assistance can be obtained, it is important to make public the following general directions, by Mr. Baker, surgeon to the Humane Society, for the treatment of drowned persons:—"Particular care should be taken to employ the means in the order described, and as quickly as possible; and in the precipitancy and confusion usual upon such occasions, cautiously to avoid every kind of violence or rough usage. It is of the greatest consequence first to cleanse the mouth and nostrils, strip off the wet clothes, wipe and clean the body, and wrap it in dry garments or blankets before it is removed, in order to avoid evaporation, and prevent exposure to a cold atmosphere. By a neglect of either of these precautions, the temperature of the body would be greatly reduced, and the prospect of resuscitation much diminished: the colder the weather the more desirable will it be promptly to strip off the wet clothes, and put on dry; this should be done upon the spot, unless a convenient place is close at hand to carry into execution the more material operations. An error in the first steps of re-

* Farrier and Naturalist's Chronicle.

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suscitative process may occasion a fatal result. It cannot, therefore, be too strongly urged upon those who humanely assist in these early moments, and who are seldom professional men, rigidly to adhere to these few articles of instruction. They may thus effectually prepare the way for the restoration of life. At the same time, I should observe, that if they attempt to take too much upon themselves, their intentions, though good, may be subversive of the proper end, and defeat the design of the medical attendant."

In a paper lately read to the Royal Academy in Paris, it was stated as the result of a calculation by the author, that in consequence of the violence of the method now used of inflating the lungs, only two-thirds of the persons susceptible of recovery from drowning are ultimately brought to life, the proportion having formerly been nine-tenths.*

SHOWER OF FROGS.

As two gentlemen were sitting conversing on a causeway pillar near Bushmills, they were very much surprised by an unusually heavy shower of frogs, half formed, falling in all directions; some of which are preserved in spirits of wine, and are now exhibited to the curious by the two resident apothecaries in Bushmills.†

Mr. Loudon also observes, when at Rouen, in September last, "we were assured by an English family resident there, that during a very heavy thunder shower, accompanied by violent wind, and almost midnight darkness, an innumerable multitude of young frogs fell on and around the house. The roof, the window-sills, and the gravel walks were covered with them. They were very small, but perfectly formed, all dead, and the next day being excessively hot, they were dried up to so many points or pills, about the size of the heads of pins. The most obvious way of accounting for this phenomenon is by supposing the water and frogs of some adjoining ponds to have been taken up by the wind in a sort of whirl or tornado."‡

NORTH AMERICAN SHREW MOLE.

The shrew mole resembles the common European mole in its habits, in leading a subterraneous life, forming galleries, throwing up little mounds of earth, and in feeding principally on earthworms and grubs. Dr. Godman has given a detailed and interesting account of their manners, particularly of one which was domesticated by Mr. Titian Peale. He mentions that they are most active early in the morning, at mid-day, and in the evening, and that they are well known in the country to have the custom of coming daily to the surface *exactly at noon*. They may then

* Lancet. † Belfast Chronicle. ‡ Mag. Nat. Hist.

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be taken alive by thrusting a spade beneath them, and throwing them on the surface, but can scarcely be caught at any other period of the day. The captive one in the possession of Mr. Peale ate considerable quantities of fresh meat, either cooked or raw, drank freely, and was remarkably lively and playful, following the hand of its feeder by the scent, burrowing for a short distance in the loose earth, and, after making a small circle, returning for more food. When engaged in eating, he employed his flexible snout in a singular manner to thrust the food into his mouth, doubling it so as to force it directly backwards.*

OYSTER FISHERIES.

OYSTERS abound on various parts of the British coast, and are consumed, under one form or another, in such numbers, as to have become a valuable article of commerce. To give some idea of its extent, and of the number of hands to which it gives employment, it may be sufficient to mention the oyster-fisheries of Essex alone. In the rivers of this county, more particularly in the Crouch, the Blackwater, and Colne, a great variety of excellent oysters are bred. The boats employed in dredging them are from fourteen to thirty or forty tons: the fitting out of one of twenty tons will require 150*l*. Of these vesssels there are upwards of 200 now employed, and above 500 men and boys. The quantity of oysters taken in a season is supposed to be about 20,000 bushels, which are chiefly disposed of in London; but they are also sent to Hamburgh, Bremen, Holland, France, and Flanders. So important, indeed, are the oyster-fisheries of Britain, that they have long been an object of attention to the legislature, and they are regulated by a Court of Admiralty. In the month of May, the fishermen are allowed to take the oysters, in order to separate the spawn from the *cultch*,† the latter of which is thrown back, to preserve the bed for the future. After this month it is felony to carry away the cultch, and punishable to take any oyster, unless, when closed, a shilling will rattle between its valves.‡ The spawn is then deposited in beds, or layers, formed for the purpose, and furnished with sluices, through which, at the spring-tides, the water is suffered to flow. This water, being stagnant, soon becomes green in warm weather; and, in a short time, the oysters acquire the same tinge, which renders them of greater value in the market. Three years, at

* Dr. Richardson's North American Zoology.

† By this term are meant the stones, gravel, old shells, &c., to which the spawn adheres; and the reason for punishing its destruction is, that, when taken away, the ooze increases, and muscles and cockles breed on the bed, and destroy the oysters, gradually occupying all the places on which the spawn should be cast.

‡ See Arcana of Science for 1829, page 130.

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least, are required to bring them to a marketable state; and the longer they remain, the more fat and delicate they become. Artificial beds, as Pliny informs us, were invented by one Sergius Arata, and first established on the Lucrine Lake, A. U. 660; and, from some circumstances mentioned by the naturalist, we may infer that the said Sergius was no loser by the speculation. In Scotland they have none of them, but eat oysters just as they are brought from their native rocks; and though certainly inferior to the genuine "Pyefleet," yet they are no despicable dainties.

The oyster is a *bivalve* shell, and there are many others of this kind which are edible. Indeed, none of them, so far as we know, are positively hurtful; though some, as the *Spóndyli*, are harsh and disagreeable, others occasionally act as poison at particular seasons, or to peculiar constitutions, and many are so small or so rare as never to have been used. The *Pécten máximus*, for example, is a much-esteemed species; and the clam (*Pécten* operculàris) is very commonly eaten in Scotland. The Anòmia undulàta, at Bordeaux, is considered a delicacy; while, on some parts of the shores of the Mediterranean, the rocks are broken with large hammers, in order to procure the Phòlas dáctylus, which abounds there, and is admired even at the tables of the luxurious. The razor-fish, common on our sandy shores, is an article of food in many places; and when they go to its capture, the Irish are said to have a song appropriate to the occasion, whence we may infer that it is a favourite with them. On a dish made of the animal of the *Mya* truncàta, and named *smurslin*, the natives of Orkney and Zetland delight to sup.*

THE ELECTRIC EEL.

THAT most singular animal, the electric eel (Gymnòtus eléctricus) abounds in the river Oronoco, in South America, and is caught, as we are informed by recent travellers, by driving a number of wild horses into the pools which they frequent. They exert their benumbing powers on the horses till exhausted, when they may be taken without danger.†

THE CANADA PORCUPINE,

WHICH lives on the bark of the larch and spruce fir, willow, &c. is described as a sluggish and unsightly animal, seldom moving far from one spot, provided its food be abundant. The following account of the use of its spines is an important fact:—It is readily attacked by the Indian dogs, and soon killed, but not without injury to its assailants; for its quills, which it erects

* Mag. Nat. Hist. † Bulletin de Sciences, Nat.

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when attacked, are rough with minute teeth, directed backwards, that have the effect of rendering this seemingly weak and flexible weapon a very dangerous one. Their points, which are pretty sharp, have no sooner insinuated themselves into the skin of an assailant, than they gradually bury themselves, and travel onwards, until they cause death, by wounding some vital organ. These spines, which are detached from the porcupine by the slightest touch, and probably by the will of the animal, soon fill the mouths of the dogs which worry it; and unless the Indian women carefully pick them out, seldom fail to kill them. Wolves occasionally die from the same cause.*

MAMMOTH CAVE.

In Warren County, Kentucky, is a cavern in limestone, which has been explored by gentlemen of science for the astonishing distance of ten miles, without finding the end.†

DEN OF RATTLESNAKES.

An emigrant family inadvertently fixed their cabin on the shelving declivity of a ledge, that proved a den of rattlesnakes. Warmed by the first fire on the hearth of the cabin, the terrible reptiles issued in numbers, and, of course, in rage, by night, into the room where the whole family slept. As happens in those cases, some slept on the floor, and some in beds. The reptiles spread in every part of the room, and mounted on every bed. Children were stung in the arms of their parents, and in each other's arms. Imagination dares not dwell on the horrors of such a scene. Most of the family were bitten to death; and those who escaped, finding the whole cabin occupied by these horrid tenants, hissing and shaking their rattles, fled from the house by beating off the covering of the roof, and escaping in that direction.‡

MALE SPERMACETI WHALE.

A male spermaceti whale had, for some weeks, been observed moving around the coasts of Essex and Kent, previous to the 16th of February, when it was perceived near Whitstable (a small fishing town, about six miles from Canterbury), in an apparently exhausted and debilitated state. Some fishermen, therefore, went boldly in quest of him; and, after a short but perilous hunt, drove him within half a mile of the shore, where the wearied animal, having in vain attempted to escape, rolled himself on his back, and almost instantly expired. He measured 62 feet in

* Dr. Richardson's N. American Zoology. † Amer. Quart. Rev.
‡ Flint's Geography and History of the United States.

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length, and 16 feet in height—a size by no means large, some having been caught in the northern seas upwards of 100 feet. Two harpoons were found sticking in his back, which seemed to be very much bruised, owing, probably, to the shallowness of the water in which he had been so long confined. The stench arising from the dead body was almost intolerable, and was smelt at three miles distant from the sea.

This whale yielded nine tons of oil, and a considerable quantity of spermaceti: much of both was, however, unfortunately lost, by oozing out of the wounds, in the interval between its death and *flencing*, as the cutting up is termed by the whale fishermen. The value of the oil is stated to be 80*l*. per ton, making the animal worth 720*l*., exclusive of the spermaceti. As soon as the prize was secured, the fortunate men dispatched one of their comrades to town, to offer it for sale for 200*l*. It is said that he succeeded in his mission; but, by some accident, not returning at the time expected, it was sold to Messrs. Enderby and Sturge, of Thames-street, for 60 guineas, the first purchaser relinquishing his claim: and coppers being erected on the beach by Mr. Sturge's men, the operation of cutting up and boiling the blubber commenced five days after its death; but, even in that short interval, the internal parts had become so insufferably putrid, that the intestines, which were three cart-loads, were carried away and spread on the fields as manure. These exuviæ were afterwards examined in the hope of discovering ambergris, but in vain.

Messrs. Enderby and Sturge liberally gave the men 40 guineas in addition to the original bargain; and they also realized 40*l*. by exhibiting the whale on the beach. The skeleton was presented by those gentlemen to the museum of the Zoological Society; but Government put in a claim to the "royal fish."

We have had the opportunity of inspecting an eye of this animal, at the Zoological Society, and find it precisely according with the descriptions given of it by Cuvier and other comparative anatomists. Its structure is extremely curious. The longest diameter of the whole globe, which is flattened anteriorly, does not exceed three inches, and that of the iris little more than one. The cavity containing the crystalline and vitreous humours is small, and completely spherical, the great bulk of the eye being composed of the sclerotic coat, which is as dense and hard as cartilage. The lens is not larger than that of a haddock, and is spherical like those of fish. The optic nerve is the size of a goose quill, and is singularly surrounded by a very peculiar, soft, spongy substance, like finely reticulated cellular membrane. This substance is rather more than an inch in diameter, and is enclosed in a sheath as dense as the coat of an artery. The muscles of the eye are not distinct, as in quadrupeds, but surround the whole ball like a purse, radiating from behind the edge of the cornea. The whole anterior part of the eye was

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destroyed. The eyes were sunk into, or rather surrounded by, blubber of nearly a foot in thickness (they were probably driven into that situation by the efforts of the fishermen to blind the animal); the mouth was long and narrow; the palate smooth; the roof of the mouth high and arched; the tongue according with the shape of the cavity it had to fill; the stomach simple; the heart about three feet across; and the aorta, of which a section is preserved at the Zoological Society, fifteen inches in diameter.*

THE THROSTLE.

An interesting fact connected with the habits of the throstle (*Turdus musicus*), was lately communicated to the Plinian Society by Mr. Macgillivray. On the shores of the Hebrides, he had frequently observed small heaps of shells, belonging to two species, the *Turbo littoreus* and *Trochus conuloides*, always broken, but without the animal, although many appeared quite fresh.

On frightening away a throstle, which he had seen engaged in breaking something which it held in its beak against a stone, he found one of the small heaps of whelks, among which was a fresh one, newly broken, and containing the animal. It may appear extraordinary that a bird possessed of so little muscular power should be able to break so thick and hard a shell. Throstles, it is well known, break the shells of snails, but these are very fragile; whereas a smart blow of a stone or hammer is required to break a periwinkle; nevertheless, the matter becomes more credible when we find, by experiment, that a very slight force is necessary for breaking a whelk, when it is thrown against a hard body; and that the shell is fractured, when allowed to fall on such a body from a height of four or five feet.†

ON THE OKRUB OF THE ANCIENT HEBREWS, AND SCORPION OF THE ENGLISH BIBLE.

Dr. Scot, in a paper before the *Wernerian Natural History Society*, gave a general description of the scorpion, which he represented as having, some species six, others eight eyes. It varies in colour—some being black, brown, yellow, &c. The common length is six or eight inches, although certain authors speak of scorpions several feet in length. It lays from twenty-six to forty eggs. The young, when hatched, get upon the back of the female, where they are protected and defended by the tail, at the extremity of which is the sting. Scorpions have frequent battles with ants, which may sometimes be seen dragging from the field one of their vanquished foes. Scorpions live among stones, &c., hate the light, feed upon flies, and other insects, and

* Mag. Nat. Hist. † Edin. Journ. of Nat. and Geo. Science.

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destroy one another. When covered with oil, they perish, their respiration being thus prevented. The effects of the sting were described from Dioscorides. They are not always fatal. Maupertuis put a hundred scorpions into a glass vessel, and at the end of fourteen days found only four of them alive, they having killed and devoured each other.*

THE BICEPHALOUS CHILD.

A BICEPHALOUS or double-formed child, named Christina-Ritta, has excited as much curiosity in Paris as have the Siamese Boys in London.

Christina-Ritta was born in Sardinia, on the 12th of March, 1829, of well-formed parents. Its mother had already had eight children. The circumstances of the birth were in no way remarkable. The monster was christened in the parish church of St. Apollinare, at Sassari—the left bust by the name of Christina, the right by that of Ritta.

The health of Ritta was more feeble than that of Christina, and in their journeys the one suffered much more than the other, which appeared to be, and which, in fact, was, endowed with a most robust constitution. The stay which it made in Lyons was, however, extremely favourable to its health. On its arrival at Paris, Ritta seemed more fatigued by the journey than really ill. But here the want of assistance in a season which began to be rigorous, caused it to sink.

Christina-Ritta is double from the head to the pelvis. The two vertebral columns are distinct to their lower extremity—that is, to the coccygis. Below the pelvis it is simple. Thus, there are two heads resting on two necks; the corresponding chests are so disposed, that the left arm belonging to Ritta naturally places itself on the neck of Christina—whose right arm places itself in the like manner on the neck of Ritta. The union of the two busts is effected towards the middle of the pectoral cavity, and on the side; so that the two corresponding breasts are almost blended together. The abdomen is single, as is also the pelvis, which is evidently formed by the junction of two primitive ones. So much for the external conformation.

Within there are two lungs, perfectly separate—two hearts, in only a single membraneous envelope, which, during life, gave rise to the belief that there was but one heart; but the hearts are so disposed that their peristaltic motions must have been in unison. A single diaphragm separates the cavity of the chest from the cavity of the abdomen—a remarkable circumstance, which clearly explains the sudden death of Christina, when in a state of perfect health. The diaphragm being an organ indispensable to the functions of respiration, the cessation of motion in the part belonging to Ritta necessarily paralysed the motion of the part

* Edinburgh Journ. Nat. and Geogr. Science.

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belonging to Christina. The latter was sucking its mother, when its sister sank, after a long struggle; suddenly, Christina quitted the breast, gave a deep sigh, and expired, at eight months of age.

There are two stomachs, and two livers united in one. The small intestines are perfectly separate, until ten or twelve inches above the colon. From certain appearances in the latter, it is evident that the judicious administration of medicine might have prolonged the life of this interesting phenomenon.*

SINKING OF LANDS.

On the 15th day of October, 1829, at Lausanne, in Switzerland, on the western slope of Mont Blony, a pasture ground suddenly sunk to a depth of from eight to ten feet, and an extent of three hundred, to the borders of the Beveyse; a new chalet of eighty cows built on this land also fell in, and the roots of a number of trees were all laid bare. On the same day, on the eastern slope, crevices and rents of from fifteen, twenty to fifty feet were formed, chalets and huts were rent and divided, and the sinking of the lands extended to the bay of Clareus.†

FEEDING SILKWORMS WITH THE LEAVES OF THE SCORZONERA.

M. Turck, of Plombieres, having proposed the employment of the leaves of the Scorzonera, known in every kitchen-garden in France, as *Salsifis*, to rear silkworms with, Mademoiselle Coge, of Epinal, was requested to try the experiment; the success was complete. The silk produced did not yield in excellence to that produced by the worms fed upon mulberry leaves; and surpassed the specimens obtained from worms fed upon lettuce leaves.

This new food does not in the least degree derange the vital functions and habits of these insects. The quantity of silk obtained was at least double to that procured by employing the lettuce leaves; and the facility with which the plants of the Scorzonera can be raised, renders it desirable that farther experiments should be made on this interesting subject.‡

We may here notice that accounts from the Cape of Good Hope state, that the rearing of silkworms is likely to become a profitable branch of industry in that colony. The silk produced there is of a very fine quality, and the worms thrive well in the open air.

THE DUGONG, THE MERMAID OF EARLY WRITERS.

Of all the cetacea, that which approaches the nearest in form to man is undoubtedly the dugong, which, when its head and breast are raised above the water, and its pectoral fins, resembling

* French Journal—Translated in the Foreign Literary Gazette.

† Edinburgh Journ. Nat. and Geog. Science.

‡ French Journ.

hands, are visible, might easily be taken by superstitious seamen for a semi-human being.*

THE SIAMESE TWINS.

(See Vignette in Title-page.)

The earliest account of the Siamese Twins is by Dr. I. C. Warren, of Boston, and was published in Professor Silliman's Journal of October last. They were received of their mother by Captain Coffin and Mr. Hunter, in a village of Siam, where the last-mentioned gentleman saw them, fishing on the banks of the river. Their father has been some time dead, since which they lived with their mother in a state of poverty. Their exhibition to the world was suggested to the mother as a means of bettering their condition; to which proposition she acceded for a liberal compensation, and the promised return of her sons at a specific time. They were first exhibited at Boston, and subsequently at New York, in the United States; whence they arrived in London in November, and are now to be seen at the Egyptian Hall, Piccadilly.

They are two distinct and perfect youths, well formed and straight, about eighteen years of age, united together by a short band at the pit of the stomach. On first seeing them, it may be supposed, so closely are their sides together—or rather, they over-lap a little—that there is no space between them. On examining them, however, they are found not to touch each other, the band which connects them being, at its shortest part, which is the upper and back part, about two inches long. At the lower front part the band, which is there soft and fleshy, or rather like soft thick skin, is about five inches long, and would be elastic, were it not for a thick rope-like cartilaginous or gristly substance, which forms the upper part of the band, and which is not above three inches long. The band is probably two inches thick at the upper part, and above an inch at the lower part. The back part of the band, which is rounded from a thickening at the places where it grows from each body, is not so long as the front part, which is comparatively flat. The breadth or depth of the band is about four inches. It grows from the lower and centre part of the breast of each boy, being a continuation of the cartilaginous termination of the breast bone, accompanied by muscles and blood-vessels, and enveloped, like every other portion of the body, with skin, &c. At present this band is not very flexible; and there is reason to believe that the cartilaginous substance of the upper part is gradually hardening, and will eventually become bone. From the nature of the band, and the manner in which it grows from each boy, it is impossible that they should be in any other position in relation to each other, but side by side, like soldiers, or coming up a little to front each other. Their arms and legs are perfectly free to move. The band is the only connexion between them; and their proximity does not inconvenience either; each of them, whether standing, sitting, or moving, generally has his arm round the neck or the waist of the other. When they take the arm from this position, so close are they kept together that their shoulders cannot be held straight; and the near shoulder of each being

* Edinburgh Journ. Nat. and Geogr. Science.

obliged to be held down or up, to allow them room to stand, gives them the appearance of being deformed; but two straighter bodies can scarcely be seen.

In their ordinary motions they may be said to resemble two persons waltzing. In a room they seem to roll about, as it were, but when they walk to any distance, they proceed straight forward with a gait like other people. As they rise up or sit down, or stoop, their movements are playful, though strange, not ungraceful, and without the appearance of constraint. The average height of their countrymen is less than that of Europeans, and they seem rather short of their age, even judging them by their own standard. They are much shorter than the ordinary run of youths in this country at eighteen years of age, and are both of the same height. In personal appearance there is a striking resemblance between them; this, however, is but on first impression, for, on closer examination, considerable difference will be observed. The colour of their skin and form of the nose, lips, and eyes, denote them as belonging to the chinese; but they have not that broad and flat face which is characteristic of the Mingol race. Their foreheads are higher and narrower than those of their countrymen generally. Both are lively and intelligent; and they pay much attention to what is passing around them.

Dr. Warren, in his report, states that he *never heard them speak to each other*, though they were very fond of talking with a young Siamese, who was brought with them as a companion. They, however, appear to have the means of communication more rapidly than by words. The point most worthy of remark, in regard to their actions and movements, is, that they seem, generally speaking, to be actuated but by one will; and that from whichever of them the volition of the moment proceeds, it seems imperative upon both. Occasionally there is an exception to this remark—as on the voyage from Siam to the United States, when one wanted to bathe, and the other refused, on account of the coldness of the weather, they quarrelled on the subject.

Each has a name of his own—the one, *Chang*, and the other, *Eng*; but when persons wish to address them as one—to claim their attention to anything, for example, or to call them—they are addressed as—*Chang Eng*.

The union of twins is not an unusual occurrence. Dr. Warren is, however, of opinion, that the Siamese Boys present the most remarkable case of *lusus naturæ* which has yet been known, taking into view the perfection and distinctness of organization, and the length of time they have lived. The whole phenomenon may be described in a very few words—*two perfect bodies united and bound together by an inseparable link*. Of their strength many instances are related: since they have arrived in London they have lifted a gentleman of considerable weight, with great ease; and on this point Drs. Mitchill and Anderson say—"As they are so vigorous and alert, we readily coincide, that in ten seconds they can lay a stout ordinary man on his back."

Upon examining the connexion, or *cord*, Dr. Warren says—

"Placing my hand on this substance, I found it extremely hard. On further examination the hardness was found to exist at the upper part of the cord only, and to be prolonged into the breast of each boy. Tracing it upwards, I found it to be constituted by a prolongation of the *ensiform cartilage of the sternum*, or extremity of the breast-bone. The cartilages proceeding from each sternum meet at an angle, and then seem to be connected by a ligament, so as to form a joint. This joint has a motion upwards and downwards, and also a lateral motion—the latter operating in such a way, that when the boys turn in either direction, the edges of the cartilage are found to open and shut.

"Besides this there is nothing remarkable felt in the connecting substance. I could distinguish no pulsating vessel. The whole of this cord is covered by the skin. It is remarkably strong, and has no great sensibility, for they allow themselves to be pulled by a rope fastened to it, without exhibiting uneasiness. The slightest impulse of one to move in any direction is immediately followed by the other; so that they appear to be influenced by the same wish."

From some characteristic anecdotes that have since appeared in the *Literary Gazette*, we learn that recently, when they were indisposed, they took medicine together, and were affected precisely in the same manner; but when medicine was administered to one and not to the other, no effect was produced on the exempt! Another exemplification of their separate state has been afforded by their dreaming. An individual who slept in the same room with them observed one extremely disturbed in his sleep, and the other so violently agitated, that he screamed out. He awoke them, and on inquiry, the one that was disturbed told him he had dreamed he met his mother; the other, who was more agitated, that he thought some one was cutting off his hair. In sleeping, they lie on their back, generally as far apart as possible. While asleep, if you touch one you also awake the other; but it appears that though a sensation is communicated, it is not the same sensation. For example, if one is tickled to cause laughter, the other knows you are tickling his brother but, he does not feel it. This is the case, whether he sees what is done or not. Though they do not often speak to each other, they occasionally converse. It has a singular effect to witness the two speaking together at the same time, on different topics, to different persons. This they will do if two beautiful females happen to address them together; for they have taste enough to be very partial to beauty in the other sex.

Of their strange formation, an accurate cast has been taken by M. Sievier, and admirably copied in wax by a pupil of Mr. B. Bolton, their medical attendant.

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THE CHINCHILLA.

The peculiar softness and beauty of the fur of the Chinchilla have been so long, so ornamentally, and so comfortably known to our fair countrywomen, that it would be paying their taste and curiosity a sorry compliment to imagine that they have no desire to become acquainted with the animal by which it is furnished. We are happy therefore to have it in our power to gratify them, as well as the scientific zoologist, by a description of so interesting a creature, being the first that has appeared in our language.

Our knowledge of this interesting animal was very imperfect and confused until the arrival of a living specimen which was brought to England by the late expedition to the north-west coast of America, under the command of Captain Beechey, and by him presented to the Zoological Society. An entire skin, rendered particularly valuable in consequence of its having the skull preserved in it, was at the same time brought home by Mr. Collie, the surgeon of Captain Beechey's vessel, and deposited in the collection of the British Museum.

The length of the body in our specimen is about nine inches, and that of the tail nearly five. Its proportions are close-set, and its limbs comparatively short, the posterior being considerably longer than the anterior. The fur is long, thick, close, woolly, somewhat crisped and entangled together, greyish or ash-coloured above, and paler beneath. The form of the head resembles that of the rabbit; the eyes are full, large, and black; and the ears broad, naked, rounded at the tips, and nearly as long as the head. The moustaches are plentiful and very long, the longest being twice the length of the head, some of them black, and others white. Four short toes, with a distinct rudiment of a thumb, terminate the anterior feet; and the posterior are furnished with the same number, three of them long, the middle more produced than the two lateral ones, and the fourth, external to the others, very short and placed far behind. On all these toes the claws are short, and nearly hidden by tufts of bristly hairs. The tail is about half the length of the body, of equal thickness throughout, and covered with long bushy hairs; it is usually kept turned up towards the back, but not reverted as in the squirrels.

Although a native of the alpine valleys of Chili, and consequently subject in its own country to the effect of a low temperature of the atmosphere, against which its thick coat affords an admirable protection, it was thought necessary to keep it during the winter in a moderately warm room, and a piece of flannel was even introduced into his sleeping apartment for its greater comfort. But this indulgence was most pertinaciously rejected, and as often as the flannel was replaced, so often was it dragged by the little animal into the outer compartment of its cage, where it amused itself with pulling it about, rolling it up and shaking

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it with its feet and teeth. In other respects it exhibits but little playfulness, and gives few signs of activity.

A second individual of this interesting species has lately been added to the collection by the kindness of Lady Knighton, in whose possession it had remained for twelve months previously to her presenting it to the Society. This specimen is larger in size and rougher in its fur than the one above described; its colour is also less uniformly grey, deriving a somewhat mottled appearance from the numerous small blackish spots which are scattered over the back and sides.*

THE HARE-INDIAN DOG.

The Mackenzie River, or, as Dr. Richardson has preferred naming it, the Hare-Indian Dog, is of small size and slender make. Its muzzle is narrow, elongated, and pointed; its ears broad at the base, pointed at the tip, and perfectly erect; its legs rather long and delicate; and its tail thick, bushy, and curved slightly upwards, but not by any means with the decided curl of the Esquimaux. Its body is covered with long straight hairs, the ground-colour of which is white, marked with large irregular patches of greyish black intermingled with various shades of brown. The ears are covered on the outside with short brown hair, which becomes blackish towards the margin and at the base; that of the inside is longer and white. On the muzzle the hair is white and very short, as also on the legs, but becomes thicker and somewhat longer on the feet, and is continued to the very extremities of the toes.

Dr. Richardson suspects that this variety of the dog "was perhaps formerly generally spread over the northern parts of America; but being fitted only for the chase, it has, since the introduction of guns, gradually given way to the mongrel race sprung from the Esquimaux, Newfoundland, and this very breed, with occasional intermixture of European kinds." It seems at present to be peculiar to the Hare-Indians and other tribes frequenting the banks of the Mackenzie River and Great Bear Lake, in the neighbourhood of which our enterprizing countrymen, Captain Sir John Franklin and Dr. Richardson, wintered with their party, previously to setting forth on their late hazardous but eminently successful expediton to explore the northern coasts of the American continent. A pair of these graceful and elegant animals were brought away by the travellers on their return, and presented to the Society soon after their arrival in England, where the third was whelped. These, we believe, are the only individuals of the race that have ever been seen in Europe. In their native country they are never known to bark, and this peculiarity is still retained by the elder dogs; but the younger one,

* Gardens and Menagerie of the Zoological Society—No. 1.

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which was born in this country, has learned to imitate the language of its fellows. They appear to be extremely valuable to the Indians by whom they are bred, who subsist almost entirely on the produce of the chase. "The Hare-Indian Dog," says Dr. Richardson, "has neither courage nor strength to fit it for pulling down any of the larger animals; but its broad feet and light make enable it to run over the snow without sinking, if the slightest crust is formed on it, and thus easily to overtake and tease the Moose or Reindeer, and keep them at bay until the hunters come up.*

ZOOLOGICAL SOCIETY.

In the *Arcana of Science* for 1829,† we gave a succinct account of the origin and progress of this Society, together with a popular description of the Gardens, &c., in the Regent's Park. In the year ending in April, 1829; the whole number of visiters had been 112,226. On some days of the season the gardens have been visited by 2,000 persons daily, at one shilling each, producing to the Society 100*l.* per day. Several animals have been added to the collection, and many new habitations erected.‡

The last report also stated, that the Society had obtained a charter; that thirty-three acres of beautiful ground, together with a farm, had been purchased near Kingston, for improving the breed of animals, by naturalizing foreign specimens, valuable for food or commercial purposes, or for ornament. The laying out of the tract of ground on the northern verge of the Regent's Park, has likewise been commenced. In addition to huts, cages, &c. for the reception of living animals, it is said that a building will be erected in the new garden for the whole or part of the Society's Museum now deposited in Bruton-street. The new garden lying beside the road, opposite to the original grounds, the communication will be by a vaulted passage beneath the road. The funds are represented to be in a flourishing condition, and the progress of the Society is highly complimentary to the intelligence and public spirit of the officers.

We have already noticed a beautiful embellished work, entitled *The Gardens of the Zoological Society illustrated*, which is now in course of publication under the patronage of the Council, and the able superintendence of the Secretary.

* Gardens and Menagerie of the Zoological Society.

† See page 184.

‡ The King's Giraffe which died at Windsor, in October last (*see page* 164) has been dissected by Messrs. Gould and Tomkins, of the Zoological Society; and it is understood, that when the skin is stuffed, His Majesty intends presenting it to the Society's Museum.

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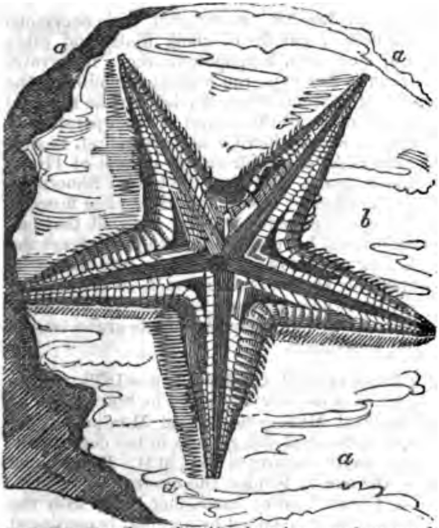
GEOLOGY.

FOSSIL ORGANIC REMAINS.

The contributions to this department of Science are exceedingly interesting. A few of the most attractive follow:—



Fossil Astèria.—Annexed is a cut of the Astèria, found at Horsington, by the Rev. James Hooper, Rector of Stawell. It was taken from a stratum of cornbrash, and is a very perfect specimen. The figure is half the exact size of the original; *a* is the stone in which it is embedded, and *b* a section of a small bivalve shell.

For the above, and three subsequent Engravings, we are indebted to the *Magazine of Natural History;* in deed, several of our Cuts are copied from that valuable work, the subjects being at the same time important and interesting to the scientific inquirer and general reader.

Petrified Tree in the Isle of Portland.—This petrified tree was found in the western quarries, nearly half a mile from the sea-shore, and as near as can be judged about 200 feet above the level of the sea, and about 10 feet below the surface: these petrifactions are found in a sort of bed, or layer of black mould, which in some part appears like burnt wood-ashes, and is from one to two feet in thickness between the beds of stone. The bed of stone above it is from one to nearly two feet in thickness, and above that bed up to the surface, is composed of shingles and slate-stone, which is very hard, and is made use of for covering the roofs of houses. The body of the tree is now of an oval form, and is as hard as flint; just above the root it is about four feet in circumference, and diminishes to about 2.9: it has the appearance of oak by the grain and knots; it was lying horizontally, and cracked in several pieces, which some think was from the weight on it; but Mr. Beale, a gentleman who has written on this subject, saw it, and affirms it must have been broken by contraction, and that the whole masses of stone must once have been in a fluid state, otherwise a bed of stone could not have been above it.—*Brande's Journ.*

Sussex.—Mr. Gideon Mantell, F.R.S., of Lewes, has laid before the Geological Society of London, a catalogue of the organic remains discovered by him in that county. The strata of Sussex are comprehended in two principal groups, the first or uppermost of which contains marine

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deposits, viz.—the Chalk, Galt or Shanklin sand; the second, or lowermost formation, is fresh water, and comprises the Hastings strata, with their subordinate divisions, the Weald clay, Tilgate Grit, and Ashburnham limestones. From an abstract, the marine have furnished 240 species of shells, while the fresh water strata have afforded but twenty-two species, &c,—*Jameson's Journal.*

London Basin.—The plains of London are covered with enormous accumulations of water-worn debris, chiefly of chalk flints, and often abounding in fossil remains of elephants, hippopotami, &c.; the gravel is not confined to the low grounds, but caps the highest summits of the district; e.g. Highgate on the north, and Shooter's-hill on the south of the river. To explain this distribution of this gravel by the operation of the actual rivers, M. Conybeare observes that it is necessary, first, to suppose that an uniform plane originally existed from the summit of Highgate to the Hertfordshire chalk downs, and from the top of Shooter's-hill to those of Kent, on the surface of which the river once flowed; secondly, that these rivers have subsequently washed away all that immense mass of materials which would be requisite thus to reconstruct the surface; and thirdly, that having worn down that surface into nearly its present form, the rivers perpetually shifted their channels so as to distribute the gravel equally over the whole plain of London, yet remained long enough in each channel to lodge there deposits of this gravel twenty or thirty feet thick.—*Philosophical Mag.*

Caves containing Human Remains.—M. Cordier, in June 1829, read to the Academy of Sciences, part of a memoir addressed to him by M. de Christol, Secretary of the Natural History Society of Montpellier, relating to two nearly discovered caves containing bones in the department of the Garde. These cases were discovered by MM. Dumas and Bonause; they are situated, the one at Pondre, the other at Jouvignargue, near Sommières. M. de Christol, after examining them with the greatest care, as well as the specimens obtained by digging, is convinced that they present the proof of an incontestible mixture of human bones with bones of mammifera belonging to extinct species. The remains of animals mixed with those of the human species belong, according to the author, to the hyæna, the badger, the bear, the stag, the aurochs, the ox, the horse, the wild boar, and the rhinoceros. Some of the bones bear evident marks of the teeth of hyænas. Excrements of these animals were also found in the caves. The facts announced by M. de Christol appeared to M. Cordier to be of the greatest importance.

Human bones have also been found in the caves of Bize, near Narbonne. Some of the bones, being of much more recent origin than any fossils hitherto discovered, seem to connect the present geological period with that which preceded historical records. In fact, there are found at Bize, in the same beds, human bones and bones belonging to extinct species, all possessing the same physical and chemical characters. These observations are calculated to bring into doubt the alleged non-existence of man in the fossil state. They bear upon new facts, and tend to prove that, in the present state of science, we cannot, with certainty, say where the regular strata of the globe terminate. The generally admitted proposition that there are no human bones in a fossil state upon our present continents, may therefore be questioned, or at least cannot be substantiated.

A circumstance which has surprised me, and which deserves the

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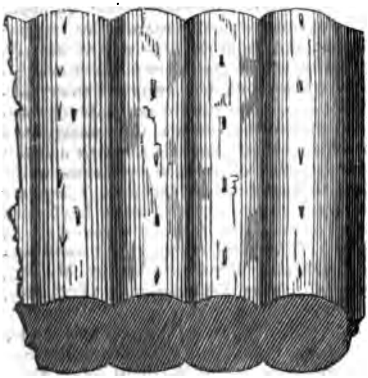
greatest attention, is the entire absence of large carnivora, which might have carried in the bones; but these being perfectly free of gnawing, we must reject that opinion.—*M. Tournal, jun. in Annales des Sc. Nat.*

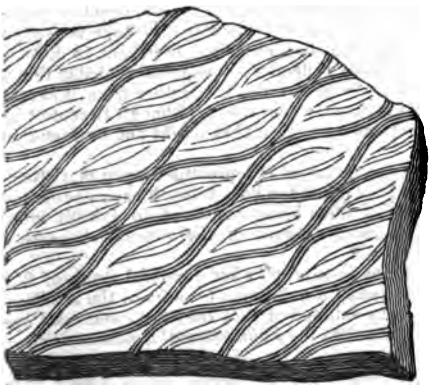
The inferences drawn from the examination of these bones have been contested; and Professor Jameson says, if the first mentioned discovery, by M. de Christol, be correct, they must be considered as more in favour of a mixture of human bones, with remains of antediluvian animals, than those furnished by the Bize caves.

Clifton, near Manchester.—The annexed cuts represent two vegetable fossils, from the little coal mine near Clifton.



The first has the appearance of a kind of rush laid side by side, and extends to about five feet in length, and about two feet in width: it generally is about an inch in depth, and contains three layers, both sides being similarly marked. The other is simply marked upon a thin seam of coal, for if the coal is taken from off the metal, no part of the impression remains.

The fossils are composed of metal, being a kind of blue shale, and were both covered with a thin seam of coal.—*Mag. Nat. Hist.*



We may add, there are few coals but that present more or less of a woody texture. This appearance may be traced from the bitumenized wood, which still bears, though approaching in its nature to coal, the trunk, the branches, and even, in some instances, the very leaves of trees, through all the varieties of coal, into the most compact, slaty kind, of the oldest formation. Nor is it less remarkable that the shale which uniformly covers the independent coal formation, *always* encloses vegetable remains, and the greater part of those geologists who have given their attention to the probable origin of coal, consider it as derived from vegetation.

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INSECTS—*(See the Plate)*.—This interesting collection was discovered near Aix, in Provence, by Messrs. Murchison and C. Lyell, jun. One of the most striking facts is, that the insects are all of European forms, and most of them belonging, it is believed, to existing genera. The greater proportion are *Diptera* and *Hemiptera*; next are the *Coleoptera*; there are a few *Hymenoptera*, and but one *Lepidopterous* insect. With the single exception of the Hydrobius, none of the species are aquatic. Mr. Curtis, F.L.S., who has examined the insects, thinks them of the temperature of the south of France, although some plants found with them are supposed to be tropical. The specimens and orders are as follow: COLEOPTERA—Fig. 1. Fam. Staphylinidæ, *Lathrobium?*—2. Fam. Curculionidæ, *Sitona?* The dark part shows the corneous covering which actually remains; and when it is peeled off, the impression of the sculpture is very perfect: the wings of this, and of Fig. 10, are extended beyond the elytra, as if they had been arrested in their flight. Fig. 3. *Liparus.*—Fig. 4. from Chrysomelidæ, *Chrysomela*, under side. OMOPTERA—Fam. Cercopidæ, Fig. 5. *Asiracca?*—Fig. 6. *Tettigonia.* DIPTERA—Fam. Tipulidæ, Fig. 7. *Limnobia*, female, apparently fixed while at rest.—Fig. 8. *Gnoriste?* either struggling on its back, or depositing her eggs.—Fig. 9. *Mycetophila?* walking, black, articulations of the body distended by pressure.—Fig. 10. Nov. Gen. (uncertain). There are several examples of this insect; the one represented seems to have been at rest; the hinder legs are broken off, and one of them is reversed, so that the tarsi nearly touch the thigh. The palpi are long, and very perfect, and the antennæ remarkably distinct. Fam. Strationidæ, Fig. 12. New Gen. apparently allied to *Sargus*. Fam. Empidæ, Fig. 11. *Empis*, female and cast.

Several of the beetles have their wings extended beyond the elytra (Figs. 2. and 3.), as if they had been flying, and had dropped; and a *Chrysomela* (Fig. 4.) has the elytra expanded, as if it had fallen upon the water and been drowned. Other insects, however (as in Figs. 7, 9, 10, and 11), seem to have been imbedded whilst in repose, or when walking, and the dislocation of the members of some may have been caused in certain instances by violent pressure, and, probably, in others, to decomposition. On reviewing the whole collection, it appears probable that a great portion of the materials have been brought together from different localities by floods, mountain torrents, and rivers, although it cannot be denied that there is no insect amongst them that might not be found in a moist wood.

In the accompanying figures one insect is represented upon marlstone, to show the nature of the subject; and the lines beneath each denote the natural size of the insects, all of them being magnified, to exhibit more distinctly the minuter parts, and the nerves of the wings.—*Jameson's Journal.*

Belemnites.—M. Raspail has discovered, after a careful study of 250 Belemnites, collected in Provence, that Belemnites are not the *shells* of animals, as geologists generally think, but that they are *cutaneous appendages* to marine animals, allied to the *Eclimodermata*, now extinct.—*Brewster's Journal.*

Fossil Charcoal accounted for.—I was particularly struck with a phenomenon recorded by Dr. Richardson, the naturalist in Franklin's expedition of discovery, respecting the shale on the coasts of the Arctic Sea. This shale composed precipitous banks, which, in many places, *were on fire*. "The shale," adds Dr. Richardson, "takes fire in conse-

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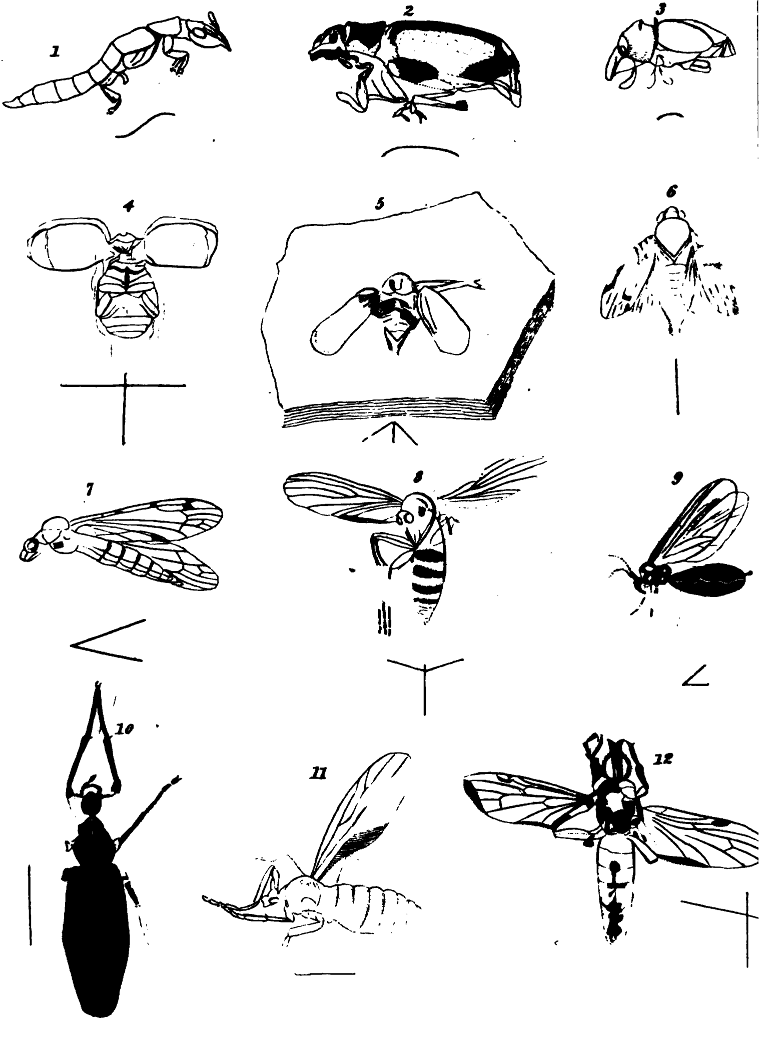
FOSSIL INSECTS

P. 23



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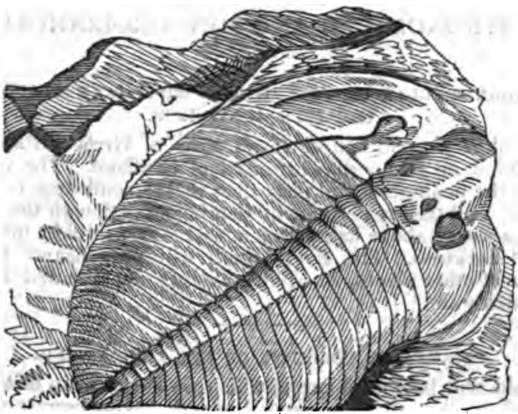
quence of its containing a considerable quantity of sulphur in a state of such minute division, that it very readily attracts oxygen from the atmosphere, and inflames." Nothing, I think, could explain in a more satisfactory manner the occurrence of charcoal in coal measures, and other mineral strata. In the anthracite mines of North America, for example, wood charcoal occurs, with the ligneous structure as well marked as in charcoal recently prepared.—*Correspondent—Mag. Nat. Hist.*

Geological Arrangement of British Fossils.—In the sixth number of the *Magazine of Natural History*, Mr. R. C. Taylor has published a series of approximate stratigraphical tables of British fossil testacea; forming an abstract of a more extended index, constructed chiefly from Sowerby's *Mineral Conchology*, and from authentic details, after essential corrections in the localities and formations. These tables exhibit the geognostical distribution of about thirteen hundred species; and, from the caution employed in constructing them, this is probably considerably short of the actual number known to collectors.—*Philosophical Mag.*

Radnorshire.—The cut represents a fine specimen of the *Trilobite*, a crustaceous fossil, from a quarry on the estate of D. Thomas, Esq., Wellfield House, Radnorshire, where they are said to abound. The stone it occurs in is either transition slate or limestone; and the figure is half the size of the impression.



As Trilobites occur only in transition rock, and the lowest beds of the mountain limestone, their presence in any country is an important geological feature; and since it further appears that the different species are peculiar to different beds, a means is pointed out of identifying these beds, or strata, at immense distances.—*Mag. Nat. Hist.*

Claw of the Iguanodon.—Among the fossil bones discovered by Mr. Mantell, of Lewes, during the past year, in the Hastings strata of Sussex, are two specimens, which M. Cuvier has determined to be the ungueal bones, or those which support the nails, of the Iguanodon. The largest is four inches in length; while the corresponding part in a recent Iguana three feet long, is but two-fifths of an inch.—*Philosophical Mag.*

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Date of Volcanic agency in Auvergne—There is extant in one of the public libraries at Rome a letter from Sidonius Apollinaris, who was Bishop of Clermont in Auvergne in the fifth century (he was born in 430, and died in 487), to Mamertus, Bishop of Vienne, in Dauphiny, stating that a dreadful calamity had befallen parts of his diocese, from the breaking out of a creeping fire, which was consuming the surface of a considerable district in those parts, particularly in Velay and the Vivarais.—Dupin mentions the circumstance in his *Ecclesiastical History of the fifth century*.—*Literary Gazette*.

An Artesian Well has been bored in the Duke of Northumberland's grounds at Syon, to the depth of 535 feet. The first 20 feet bored through consisted of loose gravel and sand; to this succeeded strong blue clay, to the depth of 410 feet; next 10 feet of green sand; then between 30 and 40 feet of loose chalk; and, finally, very firm and hard chalk, to the depth of 535 feet, which is said to extend to an unknown depth. A strong spring was found in the green sand, but it was not powerful enough to rise higher than 30 feet from the surface. The next spring was found in the solid chalk; and the two springs, united, now rise to the height of 5 feet above the surface, and the water flows over at the rate of five gallons per minute, of a temperature of 55°. Fahrenheit.—*Mag. Nat. Hist.*

ASTRONOMICAL AND METEOROLOGICAL.

THE GREAT SOLAR ECLIPSE WHICH WILL TAKE PLACE ON THE 17TH JULY, 1833.

This will be a great eclipse to all parts of Great Britain, and nearly total on the north-west coast of Scotland. The central path of the penumbra will pass near to the south-east coast of Iceland; and the greater part of that island, although the sun is for some weeks above its horizon at that season, will be involved in total darkness. The central path will pass nearer to the equator at other places, according as they are situated farther to the westward.*

REMARKABLE COLDNESS OF THE LATE SPRING.

The cold and backward spring which we have had in this country has been the subject of general remark. Our correspondent Dr. Forster, who has recently returned from a tour on the Continent, has made a corresponding remark abroad. The crops, and particularly the garden productions and flowers, have been nearly a fortnight later than usual, almost all over Germany and the northern parts of France. At Spa, the season was so cold and unpleasant, that most of the visitants had left it to travel elsewhere till there were some signs of summer; and there was

* The calculated elements of this eclipse will be found in *Jameson's Journal*, No. XI. page 23.

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ice on the water near Liege on the morning of the 8th of June. The thermometer during the day did not rise higher than 58 deg. of Fahrenheit; and a cold dry wind seemed to threaten a total destruction of vegetation. Paris, however, we understand, was comparatively warm, and the climate seemed to change for the better on passing Arras into France.*

CLIMATE OF THE HIMMALAYA.

By a recent Traveller.

I CAME upon a village at a height of 14,700 feet;—are you not surprised that human beings could exist at such an elevation? It was yet the middle of October, and the thermometer on two mornings was 17 deg.; yet the sun's rays felt oppressive, and all the streams and lakes which were sheeted with ice during the night, were free and running by two o'clock. The finest crops of barley are reared here, and to irrigation and solar heat are the people indebted for a crop. The barometer gave for the highest field 14,900 feet of elevation: this verifies the observations, or rather inferences, on the limit of cultivation in the upper course of the Sutluj; and I think it quite possible, and even probable, that crops may vegetate at 16 and 17,000 feet. The *yaks* and shawl goats at this village seemed finer than at any other spot within my observation. In fact, both men and animals appear to live on and thrive luxuriantly, in spite of those speculations which had calmly consigned those lofty regions, and those myriads of living beings, to perpetual ice and oblivion.

On the north-eastern frontier of Kunáwar, close to the stone bridge, I attained a height of more than 20,000 feet, without crossing snow, the barometer showing 14,320, thermometer 27° at 1 P.M. Notwithstanding this elevation, I felt oppressed by the sun's rays, though the air in the shade was freezing. The view from this spot was grand and terrific beyond the power of language to describe. I had anticipated a peep into China itself; but I only beheld its lofty frontier all arid, and bare, and desolate. It was a line of naked peaks, scarce a stripe of snow appearing; yet every point had an angle of altitude of a few minutes, some half a degree, and at a very considerable distance: this argues at least 21,000 feet.†

DARK DAY.

AT St. Lawrence, October 13, 1828, wind S.W., the atmosphere was filled with smoke, which, with intervening clouds, intercepted the sun's light, so as to require the use of candles several times during the day. The water which fell in the afternoon and evening was so much affected by the smoke as to be bitter to the taste.

* Jameson's Journal. † Gleanings in Science.

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DESCRIPTION OF TOOTHILL MILL, ESSEX, AS STRUCK BY LIGHTNING.

On June 18, in the afternoon, there was rain, with frequent thunder; and between five and six o'clock, a windmill at Toothill, in the parish of Stanford Rivers, between Epping and Ongar, was struck by the lightning. Those near the spot observed that the flash caused by this tremendous discharge of the electric fluid was attended with a peculiar whizzing noise, and the thunder, or rather crash, which followed almost instantaneously, consisted of at least three distinct and rapid consecutive reports; this latter circumstance was, no doubt, owing to the imperfect conductors which the lightning met with in its passage through the mill.

At the time of this accident, the head of the mill was to the north, so that the wind-shaft lay nearly in the plane of the meridian, and the sails were standing at an angle of 45 deg. with the horizon, or what the millers term "cross sail." The right hand, or eastern upper sail, was first struck by the electric fluid, not at the extremity or highest point, but near the middle, where there were an iron band and bolt, which fastened the sail to the arm; here it drove out the latter and separated the former, snapped in two the timbers, then descended to the axis, and struck off the opposite sail. It then entered the upper part of the mill by the head of the shaft, and as it here came in contact with very imperfect conductors, its powerful effects were very visible; for it not only rived, but

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drove off a large portion of the shaft on the western side, destroyed the framework of the crown or cog-wheel, and in other respects damaged or displaced every part of the machinery; the roof it completely drove off, and nearly all the boards round the mill as far as the floor. The electric fluid now became concentrated in the chain which was used for drawing up the sacks; this was in part fused, as the links were welded together in one solid mass. The good effect of the conducting power of the chain was very perceptible, as little or no damage was done in that section of the mill through which that part of the chain passed. By this chain the ethereal fire entered the lower apartment, and was diverted from its downward course by some half-hundred and other weights, standing on the floor near the western side of the mill; here it tore up a large space of the floor, the weights were ejected into the yard to a considerable distance, and the boards were forced off as before with great violence, and thrown in every direction. From this part the lightning passed to the roof of the round-house, which rises nearly to the lower floor; and as this was covered with plates of iron, it here met with a ready passage, and, darting a short distance through the air to the iron braces under the stairs, it was thence conducted to the earth without doing any further damage. As the braces did not quite reach the ground, its course by that means was again a little interrupted; and in its last effort to overcome every obstacle opposed to its furious velocity, it tore up the stones and gravel, and finally made its exit by forming a large hole near the western side of the steps, in an oblique direction, and in size and appearance somewhat like a rabbit's burrow.

Such was the violence of the explosion, that a great many pieces of the boards and large fragments of the mill were thrown into the adjoining fields to an amazing distance, and some of them must have ascended to a great height in the air, as they were observed sticking upright in the hard ground, as if driven there by a pile-driver.

The poor miller at the moment of this dreadful conflict was on the second floor, near the eastern side of the mill; and though in the midst of the most deadly commotion of things that the mind can conceive, yet happening to be out of the direct line of the fluid, and partly sheltered by some portions of the machinery, he was found alive, though shockingly maimed: his face, hands, and other parts of his body were much scorched; the splinters, and even grains of wheat from the hopper, were driven through the skin; one of his legs was so dreadfully fractured, that it was found necessary to amputate it shortly after his removal from his perilous situation.

On examining the mill shortly after the accident (says Mr. Squire, of Epping), it struck me whether or not the accidental position of the chain with respect to the weights might not have been the primary cause of this powerful discharge of the electric fluid from the impending cloud; for though a less favourable position of the conducting bodies for its transmission to the earth might not have altogether averted the stroke, yet there can be no doubt, that by a fortuitous arrangement of the different materials of elevated buildings, such a disaster as the present might be promoted, suspended, or prevented, under different electrical states of the atmosphere. Whenever the lightning strikes a tree, a building, or any other object, be the electrical state of the earth what it may, it is obvious that such a body must be a better conductor than a column of the contiguous air of the same height; were the case otherwise, the lightning would strike the ground at once, as is sometimes the case.

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The annexed cut particularly represents the following effects, already described by Mr. Squire:—After the electric matter entered the lower apartment, it was "diverted from its downward course by some half-hundred and other weights standing on the floor near the western side of the mill:" it "here tore up a large space of the floor;" and "the weights were ejected into the yard to a considerable distance, and the boards forced off with great violence, and thrown in every direction." The place where the weights stood and the floor was torn up, was to the left as you enter the door. The small portion of the external boarding which remains in one part, shews where the chain for hoisting up the sacks acted as a conductor.*

THE CONSTANT OF THE ABERRATION OF LIGHT.

Mr. Richardson, of the Greenwich Observatory, has found the constant of aberration to be 20"505 by Troughton's circle, and 20"502 by Jones' circle, from 4119 observations, made during the years 1825, 6, 7, and 8.†

PECULIAR PHENOMENA OF HUMIDITY.

In the Memoirs of the Petersburgh Academy, it is stated that, in the district of Gori, in Russia, at the foot of the Ossetin Mountains, there is a hill, on the stony surface of which, the humidity that exudes from the rock in summer and in fine weather is converted into ice, of a thickness proportionate to the heat of the sun. This ice disappears in the night, or during cloudy weather so completely that the rock is scarcely damp. The water obtained from the melted ice appears, upon analysis, to contain only a very small quantity of lime, and no other foreign matter.‡

IRIS LUNARIS.

By a Correspondent of the Mirror.

That rare and beautiful phenomenon the Iris Lunaris, or moonlight rainbow, was observed by Mr. W. Colbourne, jun. and a friend of his, from an eminence about a quarter of a mile from Sturminster, on the evening of the 14th Sept., about twenty minutes before nine o'clock, in the north-west. Its northern limb first made its appearance; but after a few minutes, the complete curvature was distinctly and beautifully displayed. The altitude of its apex seemed to be nearly forty degrees. Nothing could exceed the beauty of the appearance of this arch of milky whiteness, contrasted as it was with the sable rain fraught clouds which formed the back-ground to this interesting picture. It continued visible more than five minutes, and gradually disappeared at the western limb.

* This very interesting paper is somewhat abridged from the Mechanics' Magazine.

† Edin. Journ. of Nat. and Geo. Science. ‡ New Monthly Mag.

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INDICATIONS OF SPRING.

The following table is the register of more than sixty years' observations, made by Robert Marsham, Esq., at Stratton-Hall, which is situated nearly in the centre of Norfolk. The earliest date recorded is the year 1735, and the latest observation appears in 1800. The least variations are in the time of the appearance of the migratory birds, and the hatching of young rooks. The greatest range is in the blossoming of the turnip, the appearance of the yellow butterfly, and the singing of the thrush.

	Earliest.	Latest.	Greatest Difference observed in
Thrush sings	1735, Dec. 4	1766, Feb. 13	56 yrs.— 71 days.
Nightingale sings	1752, April 7	1792, May 19	59 yrs.— 42 days.
Churn Owl sings	1781, April 29	1792, June 26	46 yrs.— 58 days.
Cuckoo sings	1752, April 9	1767, May 7	51 yrs.— 29 days.
Ring Doves coo	1751, Dec. 27	1761, Mar. 20	47 yrs.— 83 days.
Rooks build	1800, Feb. 2	1757, Mar. 14	53 yrs.— 40 days.
Young Rooks	1747, Mar. 26	1764, April 24	52 yrs.— 29 days.
Swallows appear	1736, Mar. 30	1797, April 26	62 yrs.— 27 days.
Frogs and Toads croak	1750, Feb. 20	1771, May 4	57 yrs.— 73 days.
Yellow Butterfly appears	1790, Jan. 14	1783, April 17	36 yrs.— 93 days.
Snowdrop appears	1778, Dec. 24	1795, Feb. 10	65 yrs.— 48 days.
Turnip flowers	1796, Jan. 10	1790, June 18	55 yrs.—129 days.
Wood Anemone blows	1790, Mar. 16	1784, April 22	30 yrs.— 37 days.
Hawthorn leaf	1759, Feb. 11	1784, April 22	59 yrs.— 70 days.
Hawthorn flowers	1750, April 13	1799, June 2	59 yrs.— 50 days.
Sycamore leaf	1750, Feb. 22.	1771, May 4	57 yrs.— 71 days.
Birch leaf	1750, Feb. 21	1771, May 4	52 yrs.— 72 days.
Elm leaf	1779, Mar. 4	1784, May 6	47 yrs.— 63 days.
Mountain Ash leaf	1779, Mar. 5	1771, May 2	43 yrs. — 57 days.
Oak leaf	1750, Mar. 31	1799, May 20	54 yrs.— 50 days.
Beech leaf	1779, April 5	1771, May 10	53 yrs.— 35 days.
Horse Chestnut leaf	1763, Mar. 10	1771, May 2	47 yrs.— 52 days.
Spanish Chestnut leaf	1794, Mar. 28	1770, May 12	36 yrs.— 45 days.
Hornbeam leaf	1794, Mar. 7	1771, May 7	40 yrs.— 61 days.
Ash leaf	1779, April 2	1772, May 26	36 yrs.— 54 days.
Lime leaf	1794, Mar. 19	1756, May 7	43 yrs.— 49 days.
Maple leaf	1794, Mar. 15	1771, May 7	34 yrs.— 53 days.*

BRIGHT MORNINGS PRECEDING RAIN.

It is often observed on those clear sunny mornings which occur not rarely in summer and autumn, that it is very likely, if not certain, to rain before evening. And there is frequently much truth in the remark. We recollect that the shepherds of the Kyle division of Ayrshire draw an indication of a change of weather, founded on the same principle. The two high mountains

* Mag. Nat. Hist.

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in the isle of Jura, called from their form, the Paps of Jura, are distant sixty or eighty miles, and of course are seldom seen from the uplands of Kyle; but when they do appear on the far horizon, like twin cones formed by an azure cloud, the shepherds always predict approaching rain, and are seldom wrong. The reason is, that when moisture accumulates in the air, before it begins to be precipitated, it imparts to it a higher refractive power, and it becomes in consequence, more bright and transparent.*

ECCENTRICITY OF SATURN'S RING.

The most interesting circumstance in astronomy just now is the eccentricity of the Ring of Saturn. M. Schwalz, of Dessau, first perceived it, and having written of it to M. Harding, the latter believed that he also could observe it. M. Harding informed me of the circumstance, and I also saw that which these two gentlemen had seen, as did likewise my asssistants. I nevertheless persisted in believing that it was an optical illusion, occasioned by the shadow of the planet on the ring, and therefore wrote to M. Struve to decide the point by means of the superb micrometers attached to his great telescope. He had the goodness to measure, on five different days, the distance of the ring from the body of the planet, and he found, that what had been observed was not merely an appearance, but that Saturn was really eccentric with respect to his ring. You will see the details of these observations in my *Astronomische Nachrichten*, &c.†

WEIGHT OF PURE ATMOSPHERIC AIR.

Dr Prout is at present occupied with the investigation of this important subject; and though he has not yet brought his researches to a conclusion, he permits me to state, that 100 cubic inches of pure atmospheric air, at 60 deg. Fahr., and 30 inches of the barometer, weigh at least 31 grains. The estimate of 30.5 grains, deduced from the observations of Schuckburgh, is therefore incorrect.‡

RELATION OF RAIN AND THE MOON.

M Flaugergues, who has studied very closely the action of the moon upon our atmosphere, by observations carried on during twenty years, has constantly found a certain relation between the number of rainy days and the phases of the moon. A constant observation, he says, has proved that it rains more frequently when the barometer is low than when it is high. On the other

* Companion to the Almanac. † Schumacher, Bib. Univ. Juin.
‡ Turner's Chemistry.

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hand, observation shows that the barometer is lower in the first quarter of the moon than in the last, and lower when the moon is in perigee than when it is in apogee. From which it necessarily follows that there ought to be more rainy days in the first quadrature of the moon than in the second; and, similarly, there ought to be more rainy days when the moon is in perigee than when it is in apogee; which is in perfect accordance with numerous observations.*

EFFECTS OF SEA AIR.

THOSE who frequent the sea-coast are not long in discovering that their best dyed black hats become of a rusty brown; and similar effects are produced on some other colours. The brown is, in fact, *rust*. Most, if not all, the usual black colours have iron for a basis, the black oxide of which is developed by galls, logwood, or other substances containing gallic acid. Now the sea-air contains a proportion of the muriates over which it is wafted; and these coming into contact with anything dyed black, part with their hydrochloric (*muriatic*) acid, and form brown hydrochlorate of iron, or contribute to form the brown or red oxide, called rust. The gallic acid, indeed, from its superior affinity, has the strongest hold of the iron; but the incessant action of the sea-air, loaded with muriates, partially overcomes this, in the same way as any acid even of inferior affinity to the gallic, when put upon black stuff, will turn it brown.†

WATER-SPOUTS.

WATER-SPOUTS make their appearance from the bosom of a heavy cloud, gradually descending in a point like an inverted cone, sometimes perpendicularly, and sometimes bending, or waved. The weight and velocity of such a body of water falling into the sea, agitate and throw up the water around in a surprising manner till it is exhausted, when it disappears gradually as it began. It is obvious that the phenomenon is caused by a change in the atmosphere when full of clouds, by different contrary currents of air opposing one another, perhaps in the same manner as may be seen in streams of water, which, by the intervention of some body are variously thrown into whirlpools, which by their circular motion carry down a conical column of air in their centres.

In this manner we may suppose, that when the atmosphere is surcharged with gross and heavy vapours, put into violent motion by the impulse of contending winds, one of which must prove the most powerful, they may force one another into a circular or spiral motion to the centre of which the grossest and heaviest parts inclining, as is the case in all fluid bodies, form into a body which we see descend. The body is of various sizes; one seen

* Antologia. † Companion to the Almanac.

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at about a mile distant appeared to be about five feet in diameter; but there are some seen much larger. It cannot be ascertained from their appearance, whether they are solid or hollow in the centre.*

GREAT STORM AND FLOOD IN SCOTLAND.

THE great storm and flood, in August, last, extended, it seems, nearly simultaneously, and in equal violence, over a space of about 5,000 square miles; being that part of Scotland cut off to the north-eastward, by two lines, from the head of Lochrannoch, one towards Inverness, and another towards Stonehaven.† All the rivers within that space were flooded, proportionably, with the Dee. The damage suffered in consequence, in the destruction of bridges and roads, and lands, buildings, and crops, along the courses of the streams, has been very great, and has been estimated at half a million sterling. Happily few lives were lost.‡

SUPPOSED CHANGE OF CLIMATE.

PROFESSOR SCHOUW, of Copenhagen, has argued plausibly against the opinion, that certain climates have changed in the lapse of ages. The date tree, for instance, he says, requires a mean temperature of 78° Fahr., to bring its fruit to perfection; and it is as successfully cultivated in Palestine now as it was in the earliest times, of which he gives interesting notices. Jericho was called Palm town; and Deborah's palm tree was mentioned between Rama and Bethel. Pliny mentions the palm tree as being frequent in Judea, and chiefly about Jericho. Tacitus, Josephus, Strabo, Diodorus Siculus, and Theophrastus, all speak of woods of palm trees there; and on the Hebrew coins date trees are by no means rare, and are easily recognized by their fruit.§

CLIMATE OF MADEIRA.

By Dr. Heneiken.

SINCE the summer of 1821, says he, about thirty-five invalids (I speak from memory,) have either reached or sailed for this Island (Madeira). Of this number two or three died on shipboard, and three within a month of their landing; five or six just survived the winter, about an equal number lingered through the spring, and three or four entered upon and passed through a second winter. Of the whole number thirteen only, including myself, are now (1824) in existence. Two of those were cases of asthma, and two of chronic disease of the trachea and larynx; if these be excepted, and those be considered as dead who cannot be

* Mag. Nat. Hist.
† The storm extended much farther but without the great rain.
‡ Brande's Journal.
§ Oken's Isis.

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alive three months hence, the survivors of thirty-five or thereabouts, in the short space of two years and a half, and who so far from being cured can only make the best of a precarious existence, in a low latitude, will be reduced to six.*

RAIN IN 1828.

The quantity of rain for 1828 is less than that of any other year for the last seven years, excepting only 1826, which was but 43.060 inches. The mean quantity of rain for the last seven years is 57.727 inches. The greatest quantity taken in any year in that period was in 1824, 62.762 inches, and the least in 1826. The greatest quantity of rain in any month was in November, 1824, 13.433 inches, and the least in May 1826, 0.369. The greatest quantity in a day, in 1828, taken for the preceding twenty-four hours, was on the 8th of October, 1.420 inch.†

COMPARATIVE TEMPERATURE OF SPRINGS, AND OF THE ATMOSPHERE.

In situations where the cold is not sufficient to hinder the circulation of water, the temperature of perennial springs is almost identical with that of the atmosphere. Thus, in the vicinity of Edinburgh, the temperature of the perennial springs agrees with the mean temperature of the atmosphere. The same is the case in the whole of Atlantic Europe, and also, to a great extent, in Southern Europe. But Humboldt has discovered that this arrangement does not hold in the warmer countries, where the temperature of the springs is almost always some degrees below that of the superincumbent atmosphere. This phenomenon commences in the south of Europe; for Von Buch found a spring at St. Cesareo, near to Palestrina, at Rome, on the 20th of August, at 9½ degrees R.; the temperature of the atmosphere 22 deg. R., and the mean temperature 12.6 degrees R.‡

MOTIONS OF THE BAROMETER.

The following is an index to the motions of the barometer:—1. In summer a rise indicates the approach of fair weather. In winter, it generally indicates frost; but at all seasons, in this region, the same effect is liable to be produced by an east or north-east wind. 2. In summer, a fall generally precedes rain, or a south or south-west wind, or a hurricane or thunder. In winter, it usually precedes rain or thaw. 3. An unsettled state of the mercury usually obtains in unsettled weather. 4. The good or bad weather, which the barometer announces, will generally be of long or short duration, according as it is a longer or

* Dr. Clark on Climate.

† Brewster's Journ.

‡ Jameson's Journ.

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shorter time in coming, after the observed rise or fall of the barometer. 5. If the barometer rise from nine in the morning till three or four in the afternoon, fine weather may be more confidently expected; and if it fall from that hour of the afternoon until nine or ten at night, rain is indicated with greater certainty than when the reverse takes place; because these movements are in opposition to its natural hororary oscillations.*

SUBTERRANEOUS TEMPERATURE.

The results of experiments made at the Observatory of Paris, for ascertaining the increase of temperature on proceeding from the surface of the earth towards the interior, and which are the only ones from which a numerical expression of the law which this increase follows, may be deduced with certainty: carry to 51 feet, the depth which corresponds to the increase of 1° Fahr. of subterranean heat. Hence it follows, that the temperature of boiling water would only be 8,212 feet, or about one-and-a-half miles English, under Paris.†

AN AIR SPOUT.

On the 15th September an extraordinary phenomenon presented itself at Gorschoff, in the Russian government of Pskow. Under a cloudy but tranquil sky, a violent whirlwind, accompanied by hail and a roaring noise, suddenly arose, and, passing over the town, completely devastated whatever it met in its passage, for a breadth of about eighty yards. Several buildings were totally destroyed, and others unroofed. Large trees were torn up by the roots, and carried to the distance of ten wersts. A considerable number of persons lost their lives, and a great quantity of cattle perished. In the other parts of the town every thing was perfectly calm, not a single bough being shaken.‡

DESCRIPTION OF A DIFFERENTIAL BAROMETER.

This ingenious invention is by the late W. Hyde Wollaston, M.D. F.R.S. This instrument is capable of measuring, with considerable accuracy, extremely small differences of barometric pressure. It was originally contrived with the view of determining the force of ascent of heated air in chimneys of different kinds; but as its construction admits of any assignable degree of sensibility being given to it, it is susceptible of application to many other purposes of more extensive utility. A glass tube, of which the internal diameter is at least a quarter of an inch, being bent in the middle into the form of an inverted syphon, with the legs parallel to each other, is cemented at each of its open extremities into the bottom of a separate cistern, about two inches in diameter. One of

* Quar. Journ. Agric. † Edin. New Phil. Journ.
‡ Mechanic's Magazine.

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these cisterns is closed on all sides, excepting where a small horizontal pipe opens from it laterally at its upper part; while the other cistern remains open. The lower portion of the glass tube is filled with water or other fluid, to the height of two or three inches; while the remaining parts of the tube, together with the cistern, to the depth of about half an inch, are filled with oil; care being taken to bring the surfaces of water in both legs to the same level, by equalising the pressure of the incumbent columns of oil. If the horizontal pipe be applied to the key-hole of the door, or any similar perforation in a partition between portions of the atmosphere in which the pressures are unequal, the fluid in the corresponding half of the instrument will be depressed, while it is raised in the opposite one, until the excess of weight in the column that is elevated will just balance the external force resulting from the inequality of atmospheric pressure upon the surface of oil in both cisterns. This, however, is equal only to the difference between the weight of the column of water pressing on one side, and that of an equal column of oil which occupies the same length of tube on the other side; this difference depending upon the relative specific gravities of the two fluids, will, in the case of olive oil and water, be about one-eleventh of the weight of the column of water elevated. But the sensibility of the instrument might be increased at pleasure, by mixing with the water a greater or less quantity of alcohol, by which the excess of its specific gravity over that of the oil may be reduced to one-twentieth, one-thirtieth, or any other assignable proportion. The instrument may be converted into an areometer, by closing both the cisterns, and by applying to the upper part of each a trumpet-mouthed aperture, opening laterally.*

SHOOTING STARS.

A Mr. John Treat, a respectable farmer and a man of veracity, states that he was with the army of General Washington in the campaign against General Howe after his landing at the Head of Elk. On the night previous to the battle of Brandywine, as he was standing sentinel, a shooting star fell within a few yards of him. He instantly went to the spot, and found a gelatinous mass, which, if we recollect right, was still sparkling, and he had kept his eye on it from its fall. A very respectable lady mentioned, that, as she was walking in the evening with one or two others, a similar meteor fell near them, and she pointed out the very place where it struck. The late General Griswold also informed us, that a shooting star once fell near him upon a piece of ice, as he was walking with two other persons in the street of East Hartford.†

RULES FOR THE WEATHER.

A wet summer is always followed by a frosty winter, but it happens occasionally that the cold extends no farther. Two remarkable instances of this occurred in 1807-8 and 1813-14. With these exceptions, every frosty winter has been followed by a cold summer.

* Brewster's Journal. † Silliman's Journal.

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The true cause of cold, or rather the direct cause, is to be found in the winter excess of west wind, every winter with excess of west wind being followed by a cold summer; and if there is no cold before, or during a first excess, then a second excess of west wind in winter occasions a still colder summer than the first. It also appears, by repeated experience, that cold does not extend to more than two years at a time.

Again, if the winter excess of east wind be great, in the first instance, the winters will be mild, and followed by mild summers; while the summer excess of east wind is itself, in the first instance, always mild; but uniformly followed by cold winters and cold summers, which continue, more or less, for one or two years, according to circumstances.*

ELASTICITY OF THE ATMOSPHERE.

At the height of three miles the air is twice as thin as at the level of the sea: that is, one foot, if carried up from the lower level, would spring out so as to occupy two feet, and, at the height of fifteen miles, one foot would spring out into thirty.†

ELECTRICITY OF THE WINDS.

In the Mediterranean Mr. Black ascertained, by numerous observations, that winds or currents of vapour of some continuance from an extent of sea, are *negatively* charged with electricity; while those from the land, especially from hilly countries, are relatively in a positive condition. When opposite winds, such as north and south, are differently charged with electricity and meet, a transfer of the electric matter is always the consequence.‡

MALARIA THE CAUSE OF SUN-STROKE.

Dr. M'Culloch is of opinion that the sun-stroke, or *coup-de-soleil*, as it is called, which proves so often fatal in hot climates, and is commonly attributed to the sun, is probably nothing more than the access of marsh fever, caused by exposure to malaria on the previous evening or morning. It is not, however, denied, that exposure to a burning vertical sun may not produce inflammation of the brain, and prove rapidly fatal.§

GREEN METEOR.

Extract of a letter from Mr. B. D. Silliman to Professor Silliman.

On the night of the 11th of February, between eleven and twelve o'clock, as I was crossing the East River between New York

* Mackenzie, Syst. of the Weather.
† Quar. Journ. of Agric.
‡ Journ. in Mediterranean.
§ Brande's Journal.

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and Long Island, I observed a beautiful meteor, which was visible for the space of about two seconds. Its course was from a point perhaps five degrees below the zenith towards the horizon in a north-east direction. It described an arc of perhaps twenty degrees, when it apparently exploded, but without any report that I could hear. Its colour was *a singularly pure grass-green* of a light shade; the trail which it left was of the same colour, and so were the scintillations which accompanied its apparent explosion. The latter were distinct, like those accompanying the bursting of a rocket, but by no means so numerous.*

RULES FOR DETERMINING THE TEMPERATURE OF A COUNTRY.

The fact that a degree of latitude is equal to a degree of Fahrenheit, and that 400 feet of elevation is equal, also, to a degree of Fahrenheit, is original and curious, and will go far to assist us in determining the clime of any country.†

SUBSTANCE, WHICH FELL FROM THE ATMOSPHERE IN THE PROVINCE OF ROMOE, PERSIA.

The packet containing this substance was sent to France, and confided to the hands of M. Thenard: it was labelled, "Grains which fell from the sky in Persia:" and accompanied by a note, which said, that "Lieut.-Gen. Count de Soklen, who served in Persia, has lately received from that country a small quantity of grains, which fell from the sky, and which, in some places covered the earth to the depth of six inches. This astonishing rain fell in the province of Romoe, not far from Mount Ararat. It appears not to be the first time; for the inhabitants say they saw it happen in 1824. This unexpected substance was gathered in the beginning of April; but unfortunately, the direction of the wind at the time was not noticed. Sheep first ate of the substance; after which men gathered it, and made a very passable sort of bread."

MM. Thenard and Desfontaines soon ascertained that it was probably a lichen, and perhaps belonging to the genus *Lecidea*. Chemical analyses also indicated the substance to be a species of lichen. M. Thenard remarks, that it is easy to suppose how lichens may form layers six inches in thickness in particular places; considering, that when transported from their original locality by the winds, they ought to accumulate here and there, according to the nature of the ground, and the obstacles naturally offered in different situations.‡

* Silliman's Journal. † American Quart. Rev.

‡ Ann. de Chimie.

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METEOROLOGICAL SUMMARY OF 1829.*

Month.	Temperature. Mean.	Temperature. Highest at Noon.	Mean Atmospheric Pressure.	Prevailing Winds.	Highest Dew Point.	Prevailing modifications of Cloud. Curl cl.	Wane cl.	Staken cl.	Sonder cl.	Twain cl.	Rain cl.	Fall cl.
January	36.5	37	29.92	W. and S.W.	40.5	..	..			..		
February	38.0	42	30.67	W. — —	49.0		..	..			..	
March	43.0	54	29.82	— —	59.5		..				..	
April	48.0	57	29.42	S.W. and E.	58.0	..	..	..		..	..	
May	58.0	70.5	29.74	— —	63.0		..	..				
June	62.0	77.5	29.67	S. and N.W.	70.5		..	..			..	
July	64.5	77.0	29.99	S.W.	67.5		..	..			..	
August	61.0	79.0	29.55	S. and S.W.	69.5		..	..			..	
September	57.0	70.0	29.56	S.W. and N.W.	66.5	..	..	..			..	..
October	49.0	57.0	30.77	— —	67.0	..	..	..	..			
November	42.5	56.0	29.72	— and N.E.	40.0		..	..		..		
December	33.0	49.0	29.64	S.E. —	53.0		..	..				

The modification of Cloud which prevailed during the Month is signified by dots.

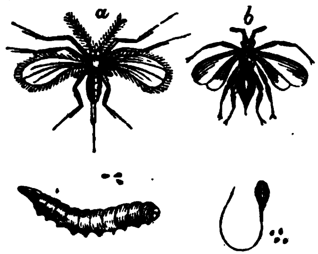
* Communicated by Dr. Armstrong, Hampstead.

AGRICULTURE

AND

RURAL ECONOMY.

Wheat Insects.—The means which Nature employs to restrain the diminutive wheat-ear fly within due bounds, are the very same as she employs to keep within bounds whales of 60 ft. long, viz. providing other species to prey upon them. The law of mutual destruction pervades the whole animal, and is found in the vegetable, creation. There are three other flies which seem to depend upon the wheat flies for their subsistence. One of these, the *Tipula*, or Cecidomyia, *tritici* (see the cut *a*), hovers around the ear in the evening; while another very minute fly, the *Ichneùmon* inserèns (*b*), is found round the ear all the day. These last flies appear of great self-denial and curious fancy; for they only lay an egg beside an egg of the wheat fly, which is hatched along with it, devours it, and saves the wheat.



The most abundant species of these ichneumons, or flies of prey, positively lays its egg in the very body of the yellow maggot, while it is feeding busily. It has a long hollow rod, projected at pleasure from its tail, which it thrusts at pleasure into the body of the worm, and down which it then sends one egg from its body, which egg is hatched within the body of the maggot, and consumes it.—*Quarterly Journal of Agriculture.*

Nitre as Manure.—Thomas Bruce, Esq. of Grangemuir, applied nitre to "wheat after a crop of potatoes, upon a strong loam; and to grass, intended for hay, upon a stiff clay. Upon both, the effect has been wonderful." The nitre was obtained from Messrs. Forman and Haddow, 51, Lime-street, London. William Hawkins, Esq., of Hitchin, Herts, gives the experience of twelve of his neighbours of this salt. They all agree that it should be sown in damp weather, that it improves chalky soils, and that its effects are particularly striking on the pasture grasses and on clover. It was first used in the neighbourhood of Hitchin, about fifteen years ago, at the suggestion of an ingenious gentleman, Mr. Bessanier. From 1 to 2 cwt. is sown per acre in March or April. One gentleman has used it fifteen, another twelve, another ten, another six, years, &c.—*Ibid.*

Draining Bogs.—A very interesting work of this kind is likely to be soon undertaken. There is a chain of three lakes in Galway, very near

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one another, Lough Corrib, Lough Mask, and Lough Corra. By cutting a gallery 3,000 ft. (1¾ miles) long, through a limestone rock between the first and second of these lakes, an interior navigation of 30 miles can be opened up, and 16,500 acres of land, now all under water, will be drained. The costs of the gallery are estimated at 30,000*l.*, and the value of the land to be gained at 330,000*l.*—*Scotsman*

Draining.—Instead of ascribing the foulness of our pastures—the lateness and poorness of our crops—the stiffness of our land—the miriness about the farm-yard—the wetness of the land—the coughs and consumptions of the family, to the quantity of rain that falls, let the ground be effectually drained, and the heart of the air will be warmed towards the farmer. Rain will be sent in due quantity to refresh the fields, but it will no longer be left in the furrows. The warm air will suck it up as soon as could be wished. Without draining off the superfluous water, it may be safely stated, that an elevation in the temperature of the air would be productive of the most fatal consequences.—*Quart. Journ. of Agriculture.*

Burning Lime.—Mr. Wallace, of Wigton, has shown that when coals are scarce, lime may be burnt with wood or peat, placed in layers in a conical form, covered with clay, and of 5 or 6 yards in diameter, with a funnel of dry furze and peat in the centre, of 2 ft. in diameter. The pile is set fire to by the top of this funnel, which will burn down to the bottom, and set the whole into combustion.—*Ibid.*

Breeding.—In the *Quarterly Journal of Agriculture* an extract is given from the *Annales de l' Agriculture Françaiśe*, the object of which is to show that in breeding, a greater number of one sex than of the other, may be obtained at the option of the breeder. The principle is, when most males are wanted, strengthen the power of the male parents relatively to the strength of the females; and when most females are wanted the contrary. The application to a flock of sheep is thus given. The farmer wishing a great number of female lambs, is recommended to put very young rams to the ewes; and also, that during the season that the rams are with the ewes, the ewes should have more abundant pasture than the rams. When male lambs are chiefly to be obtained, strong and vigorous rams, four or five years old, are to be put to the ewes.

Propagation of Genuine Agricultural Seed.—Selection is the principle for procuring abundance of genuine seeds, and the process even with the different sorts of corn is not, as might be supposed, tedious. In 1823, Mr. Shirreff marked a vigorous wheat plant, near the centre of a field, which produced him 2,473 grains. These were dibbled in the autumn of the same year, the produce sown broadcast the second and third years, and the fourth harvest produced 40 quarters of sound grain. A fine purple-topped Swedish turnip produced 100,296 grains, which was seed enough for five imperial acres; and thus, in three years, one turnip would produce seed enough for Great Britain for a year.—*Quar. Journ. Agric.*

Weevils in Granaries.—Wash the floor and sides of the granary with a mixture of urine and water before the corn is stored up: this washing is to be repeated several times, the walls and floors of the granary being well swept between each operation.—*From the French.*

To correct Damaged Grain.—Musty grain, totally unfit for use, and which can scarcely be ground, may, it is said, be rendered perfectly sweet and sound by simply immersing it in boiling water, and letting it remain till the water becomes cold. The quantity of water must be double that of the corn to be purified. The musty quality rarely penetrates through the husk of the wheat, and in the very worst cases it does not extend

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through the amylaceous matter which lies immediately under the skin. In the hot water all the decayed or rotten grain swims on the surface, so that the remaining wheat is effectually cleansed from all impurities, without any material loss. It is afterwards to be dried, stirring occasionally, on the kiln.—*Mechanics' Mag.*

Preservation of Grain in Reservoirs of Clay.—A German erected with unburnt bricks a square building, 28 ft. on each side, and 35 ft. high; the walls 3 ft. thick, and the bricks well conjoined by means of clay; the floor also was formed of worked clay, and raised a foot above the level of the surrounding ground. This tub, as it were, being covered with a simple roofing, and thatched, and the brick-work completely dry, 1,100 sacks of dry wheat were poured into it: the wheat was covered with straw, and over this straw was placed a layer of dry clay, a foot thick, thoroughly trodden and beaten down. Several years afterwards, on the opening of this magazine, the wheat was found dry, and perfectly good; and, what is more, is said to have possessed, for the purposes of making bread and pastry, qualities far superior to those of wheat preserved in magazines admitting air.—*London Mag.*

Hatching Eggs by Hot Mineral Waters.—This curious process has lately been practised with great success in the south of France. It consists in putting the eggs into a small basket, suspending the latter in a stove heated by the hot mineral water, and turning the eggs every day. The first trial was attended with success, and no failure was experienced in four repetitions of it.

Beer and Spirits made from Indian Corn.—Among the usages to which Indian corn is applicable, and which Mr. Cobbett, in his treatise, has omitted to mention, are the making of beer and spirits. It is known that large quantities of the latter article are made from it in Adams County, Ohio, Cincinnati, Nelson County, Kentucky, Cayuga County. New York, and doubtless in many other parts of the United States. Indian corn and rye are generally mixed about half and half. The produce from the Indian corn by itself is represented to be about two gallons from each bushel of the corn; a description of the mode of malting, or the process of distillation, is wanting.—*Gard. Mag.*

Remedy against the Black Fly in Turnips.—A farmer, who farmed extensively, had his turnips subject, for many years, to the attack of the black fly, in common with most of his neighbours. He was advised by some one who had tried with success what he recommended, to rub the turnip-seed among flour of sulphur, and to let it lie amongst it for some short time, and then sow both seed and sulphur together. By persevering in this practice for fifteen years, he evaded the attacks of the fly all that time, which was as long as he continued to farm.—*Quarterly Journal of Agriculture.*

Salve for Wounds in Woolly Animals.—A number of the Bibliothèque Physico-économique recommends an ounce of hog's lard and four drams of powdered charcoal, well mixed as a pomatum, to be used for the wounds of wool-bearing animals, as producing a quick healing: it is also said to be efficacious in sores of a gangrenous nature.

Manifold Properties of the Elder Tree.—The elder tree does as much good by its noxious as by its agreeable qualities. If corn or other vegetables be smartly whipped with the branches, they will communicate a sufficient portion of this scent to keep off the insects by which so many plants are frequently blighted. An infusion of the leaves poured over plants will preserve them from caterpillars also.—The wine made from

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the berries is well known; but, perhaps, it may not be so generally known that the buds make an excellent pickle. A water distilled from the flowers rivals buttermilk itself as a rural cosmetic. In some remote country-places it supplies the place both of the surgeon and the druggist; it furnishes ointments, infusions, and decoctions, for all ailments, cuts, or bruises. Every part of it serves some useful purpose; the wood, pith, bark, leaves, buds, flowers, and fruit. Its narcotic scent makes it unwholesome to sleep under its shade.—*Mag Nat. Hist.*

Cow Cabbage.—I received a packet of the seed of this extraordinary cabbage, from a gentleman of Cirencester, who brought it from Jersey, and have sown it. In his garden, I have seen five healthy plants, which weathered last winter, in the open garden, remarkably well, and seem to be equally hardy with their congeners. I subjoin a sketch and description of this curious esculent, as supplied me in a communication from this friend.

The above is somewhat the appearance of a plot of a variety of cow cabbage lately growing in Jersey. It is much cultivated there, and attains the height of from 4 feet to 10 feet or 12 feet. The little farmers feed the cows with the leaves, plucking them from the stem as they grow, and leaving a bunch or head at the top. The stems are very strong, and used for roofing small out-buildings; and after this purpose is answered, and they are become dry, they are used for fuel. When the gathering of the leaves is finished at the end of the year, the terminating bud or head is boiled, and said to be particularly sweet.—*Correspondent of Gard. Mag.*

The culture of the *Cow Cabbage* is thus stated by a nurseryman of Jersey:—The seed is sown, from about the 20th of August to the 1st of September, in a good soil, and planted out, from November to January and February, in succession, at from 20 to 30 inches distance, in a good, substantial, well-manured soil; as no plant is more exhausting or requires a better soil, but, perhaps, no one plant produces so large a quantity of nutriment during its period of vegetation. About the month of April they begin (from the first crop) to strip the under leaves, cut them in

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small pieces, mix them with sour milk, bran, and other farinaceous substances, and give them as food to ducks, geese, hogs, &c. During the whole summer they continue stripping the plant as above stated, until it attains the height of from six to twelve feet; and, if a scarcity of herbage prevails, the green leaves form excellent feed for cows and oxen, with alternate feeds of hay and straw. The tops and side shoots are excellent at table during winter and spring. The longest of the stalks are frequently used to support scarlet-runners and other French beans, and as cross rafters for farm buildings under thatch, and have been known to last more than half a century, when kept dry, for the latter purpose.—*Gard. Mag.*

Mangold Wurzel.—Last year there was grown on Lord King's farm, at Ockham, a remarkable crop. The rows were 3 feet 6 inches or near 4 feet distant. The crop is said to have weighed between 50 and 60 tons per acre without the leaves; and three of the largest plants grown here in 1827, weighed 31 lbs. each root.—*Ibid.*

Crops on Moss Soil.—As an instance of what crops can be produced from the moss grounds in the neighbourhood of Paisley, under proper management, we may mention that a field of one and a half acre, sold by the magistrates and town council to William Cochran, weaver, in 1780, for 45*s*., and 8*s*. 8½*d*. of yearly feu-duty, was reaped on the 19th of October, and yielded the following excellent crop of wheat, viz., fifty-four stooks, containing fourteen sheaves in each stook. The sheaves stand upwards of 6 ft. in height, and the heads are remarkably well filled and heavy. The field was in hay in 1827, it was summer fallowed and manured with 12 cwt. of salt, 30 carts of short dung, and 300 of earth.—*Paisley Advertiser.*

Goats.—A clever paper, by a Lancashire correspondent of the *British Farmer's Mag.*, recommends the goat as a milk-giving animal for cottagers, and even for farmers. "Not a farmer in England but would find very many advantages in keeping a little herd, yet we do not meet with it from the Tees to the Thames; not a cottager in his employ but would have reason to be thankful to heaven for a cleanly docile animal, that would supply him with milk, the finest in nature, at morn, at eve, and in the summer at noon-day; that would bring him two, and sometimes three young ones yearly, requiring less at his hands than can well be conceived."

Waste Lands.—It seems there are upwards of 8 millions of acres of waste lands in the Scotch and English counties; or more probably, according to the writer, 10 millions of acres, and 4 millions in Ireland. Yorkshire alone contains 600,000 waste acres, and 100,000 unemployed and half-starved artisans and labourers.—*News.*

Phenomena of Dew.—Why should dew be more abundant in fine clear weather than in cloudy weather equally warm, and in the open lawn than under the shade of trees? The reason given is, that, in clear weather, and in the open lawn, the surface of the earth, during night, is cooled farther down than if there were clouds or trees over it to reflect back again the heat that streams up from it. Why, if we have risen by day-break, are we so often astonished by finding the ground covered with hoar-frost after a fine clear spring or autumn day? The reason is, that in very clear weather, the ground cools itself so far, that there is scarcely a month in the year when it is not liable, at some hour of the night, to be cooled down to the freezing point. Why can we protect peach-blossoms, in early spring, from being destroyed by frost, sim-

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ply by hanging a net over the tree? One would think that frosty air would have as free access to them through the meshes of the net as if they were altogether exposed. But it is not the air that is frosty, it is the blossoms themselves; and the net, like a cloud, prevents them from becoming cold to this degree; and as the object, at this early season in our climate, is to give the flower-buds as good a constitution as possible, to keep them cool, but to prevent a chill, net-work over them may be a more appropriate covering than mats. But the quantity made use of any particular night, should, of course, depend on the quantity of cold that would probably be generated on them during that night.—*Quart. Journ. Agric.*

Saltpetre as Manure.—The bulk of saltpetre used in this country comes from the East Indies, where, at certain seasons of the year, they find it deposited on the surface of the soil. It is swept off once or twice a week, and as often renewed. At Apulia, near Naples, there is, according to Parker, a bed containing 40 per cent. of it; and in Switzerland, the farmers extract it in abundance from the earth under the stalls of their cattle. This fact is worth remembering, as in many places the urine of cattle is almost neglected, and it contains potass in abundance. The French were, during the war of the revolution, driven to artificial means for its production, as their foreign supply was cut off. The theory of its formation is detailed by Count Chaptal, in Annales de Chimie, tom. xx; and lest any body should fear it will be all exhausted if brought into general use, Mr. Bowles, in his introduction to the Natural History of Spain, assures us there is enough of it in that country to supply all Europe to the end of time. Its introduction into this part of the world took place about fifteen years ago, on the suggestion of an ingenious gentleman named Bessanier. His attention had been excited by an advertisement, which announced that the advertiser was able to make an excellent manure of some material, brought from the East Indies. Happily this hint fell upon good ground. Mr. Bessanier knew that nitre was found more abundantly in the east than elsewhere; and it occurred to him to inquire, whether it might not be the substance to which allusion was made. He made the experiment, which succeeded beyond his hope.—*Ib.*

Food of Bees.—The American black willow and the red maple, are the first trees that are visited by bees. They are fond of the crocus, which is the earliest of our bulbous roots. The stercorary and piggery are next resorted to by these insects, and the extract absorbed from them must be used as a tonic. Blossoms of all kinds, excepting those of the red clover and the honeysuckle, are excellent food; and the bees especially profit by the increased attention bestowed at present on the cultivation of the peach-tree in some parts of America. They not only drink the nectar and abstract the pollen of the flower, but they appropriate the peach itself. We have seen twenty or thirty bees devour a peach in half an hour; that is they carried the juices of it to their cells. Strawberry blossoms, mignonette, wild and garden thyme, herbs of all kinds, apple, plum, cherry, and above all, raspberry blossoms and white clover, are delicious food for them, and a thriving orchard and apiary fitly go together. —*North American Review.*

Economy in Horses' Food.—The custom of feeding horses with coarse bread is common in France, as more wholesome, more economical, and more portable, than oats. The *Furet de Londres* furnishes the following proportions of ingredients for making such bread, as adopted by a Silesian

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experimental farmer:—Five gallons of oat flour, ditto of rye flour, yeast, one gallon and a half of potatoes, reduced to a pap. With the bread made from this quantity of materials he fed seven horses a-day, at the rate of twelve pounds of bread, cut into pieces, to each horse, and mixed up with a little straw, chaffed and moistened.

To destroy Vermin on Cattle, and to cure the Mange.—Put into an earthen vessel four ounces of flour of sulphur, and a pound weight of nut-oil; place the vessel upon a moderate fire, and stir the mixture with a piece of wood, until part of the flour of sulphur is dissolved, and the oil has acquired a reddish-brown colour; then remove it from off the fire, and, before it is entirely cold, add four ounces of oil of turpentine; then stir it again until it is incorporated. When used, it is merely put upon the parts infected with a feather.—*From the French.*

GARDENING.

Fruit Trees.—Instruction in the culture of fruit trees forms part of the education of the ordinary seminaries of the state of Mecklenburgh Schwerin. No schoolmaster is admitted to exercise that function, without a certificate of his capacity to teach the management of fruit trees. The same masters are obliged to take care of fruit gardens; and those who, previously to the promulgation of the law on the subject, were ignorant of the art, receive the due instruction at the expense of the school fund.—*For. Rev.*

The finest Show of Geraniums which we have seen in any private collection this season, was in a garden at Craven Hill, Bayswater. The circumstance is worthy of particular notice, on account of the plants having been kept all the winter in pits, without the aid of artificial heat of any description; but well covered up every night, aired in fine days, and never over-watered.—*Gard. Mag.*

Horticultural Society's Fête, 1829.—The number of Fellows of the Society to whom tickets were sold was 381, at 1*l.* 1*s.* each, making 400*l.* 1*s.*; tickets sold to non-members at 1*l.* 1*s.*, 3,365, producing 3,533*l.* 5*s.*; ditto, at 1*l.* 11*s.* 6*d.*, 383, producing 603*l.* 4*s.* 6*d.*; ditto, at 2*l.* 2*s.*, 309, producing 648*l.* 1*s.* The total number of tickets sold was 4,438, producing 5,185*l.* 8*s.* 6*d.* Of the tickets sold only 3,644 were presented at the gardens, owing, no doubt, to the unpropitious state of the weather. The sum due to Mr. Gunter, who provided the repast, was stated to be 3,106*l.* 12*s.* Other expenses were *estimated* at 1,524*l.* 19*s.* 4*d.*, including 346*l.* for work done expressly for the fête, leaving an estimated balance on the transaction, in favour of the Society, of 123*l.* 17*s.* 2*d.*—*Times.*

Preservation of Potatoes.—Potatoes at the depth of one foot in the ground, produce shoots near the end of spring; at the depth of two feet they appear in the middle of summer; at three feet they are very short, and never come to the surface; and between three and five feet they cease to vegetate. In consequence of observing these effects, several parcels of potatoes were buried in a garden at the depth of three and a half feet, and were not removed until after an interval of one or two years. They were then found without any shoots, and possessing their original freshness, firmness, goodness, and taste.

The Subterraneous Growth of Potatoes may also be managed thus:—Lay a mixture of two parts Danube sand, and one part common earth,

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an inch thick, in one corner of a cellar; and, in April, place potatoes with their skins upon its surface; and, at the end of the following November, the best potatoes may be gathered. This trial may be advantageously applied in fortified places, hospitals, houses of correction, and, in general, in all places where cellars or subterraneous places occur, being neither too cold nor too moist.—*From the French.*

Everlasting Potato.—This root is ever ready to afford a supply of early potatoes, from one end of the year to the other: they are left undisturbed, except when a dish is wanted; they are not deeply embedded, but soon discovered on stirring the surface mould. The flower seems somewhat different from that of the common potato. They should be planted about the latter end of May; if planted sooner they come in too early. Before frost sets in the bed is covered with litter as a protection from its influence. They are taken up at Christmas, as fine new potatoes, and are either suffered to remain undisturbed, or perhaps, what is still better, the potatoes are completely forked up as they are wanted, and the smallest being separated are set apart for seed, under a heap or hillock, to be replanted towards the close of the succeeding May. The smallest sprig of this potato will grow.—*Gard. Mag.*

Slugs among Cauliflowers, &c. are effectually destroyed by spreading well-cut chaff round young plants under hand glasses, and some round the outside of the glasses. The slugs, in their attempts to reach the plant, become enveloped in the chaff, which prevents their moving—*Ibid.*

Chlorine has been employed in raising seeds, by Mr. George Sinclair of Woburn, with singular success. He obtains it by mixing a table-spoonful of muriatic acid with a similar quantity of black oxide of manganese, and half a pint of water. After the mixture had remained two or three hours, he immersed the seed in the liquid for a similar period, and it was then sown. Another and better method is as follows; by which he has made tropical seeds vegetate, which refused to germinate otherwise. He placed the mixed ingredients in a glass retort, inserting its bulb in the hot-bed, and bringing its beak under the pot in which the seeds were sown, connecting it with the draining aperture of the pot. The chlorine gas is gradually evolved, passing through the earth of the pot to the seeds, according as the heat required for the different species induces.—*Ibid.*

*An Onion Planted near a Rose said to increase its Odour.**—Mr. John Murray has explained this fact by submitting the onion to chemical analysis, when he discovered that it contained much ammonia. Mons. Robiquet, of Paris, some years ago proved that ammonia possessed the peculiar property of restoring the lost aroma, as in musk, &c.; and he is also of opinion it is the efficient cause in the developement of the aroma in flowers; and that night-smelling plants, as the *Gerànium trìste, Ròsa odòra,* &c., are indebted for this very peculiar feature in their physiology to ammoniacal gas, liberated at this season of repose, and at no other period of the day, What effect the cautious administration of a solution of carbonate of ammonia to sweet-scented flowers, in the form of a gentle watering occasionally, may produce, experiments can alone determine. When rose leaves, &c. are preserved in perfume-jars, common salt is generally sprinkled over them. A little powdered carbonate of ammonia increases the aroma.—*Gard. Mag.*

The Mulberry Tree grows indigenously throughout the United States, and it is thought that silk can be raised with facility from the northern

* See Arcana of Science, for 1829, page 178.

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to the southern boundary of the Union. This article costs the country now 6 or 7,000,000 dollars. Very beautiful specimens of silk have been exhibited in Baltimore, which are the product of worms raised in that city, and spun by a machine, of which Mr. J. A. Blane is the maker. That gentleman, who is by birth a Piedmontese, was largely engaged in the manufacture of silk before he was compelled to leave his native land. He is of opinion that no climate is better adapted to the silk-worm than Baltimore.—*Newsp.*

A Correspondent of the *Gardener's Mag.* has proved by experiment that the mulberry may be raised by planting part of the branch or stem; provided that the branch lies sometime on the ground, that the sap may thicken before the truncheon is planted.

Preserving Plants from the Caterpillar.—An experiment has been tried for three years to preserve gooseberry plants from the ravages of the caterpillar, by brushing the stems with a soft brush dipped in common train or fish oil, about the time of their first appearance, or at any time when infested, which appears to destroy or greatly annoy them. It also much improves the growth and productiveness of the tree the following year, and clears it of moss.—*New Monthly Mag.*

Vines in the open Air.—My method of managing the grape vine on open walls is as follows: as soon as fruit is gathered from a tree, or even a single branch, I immediately cut off the leaves, and, if necessary, prune it for the next year; as by careful attention in stopping the shoot at a proper length, it will need but little pruning, except only removing old or useless parts. This early pruning, in my opinion, assists to ripen the wood, without which no great crop can be expected; but I never noticed that it caused the vine to shoot earlier in the following spring. I must be permitted to say, that grapes out of doors, in general, are not well understood. I have been a vine-dresser for these twenty years. From the Black Hamburg I never missed having a crop of fine ripe grapes, from the beginning of the ripening reason, till the Sunday before Christmas, save only once, that year (1814) in which the Emperor Alexander of Russia was in London. In that season my crop was only fit for wine, and very good it was, though made on the gooseberry-wine process. The only secret in ripening grapes in the open air, is timely summer pruning, and constantly keeping the fruit close to the wall. With attention to this material point, I had bunches weighing from a few ounces, up to two pounds. The Hamburgh ripens within a fortnight of the Black Cluster, and is a superior fruit for every purpose. I always use open black muslin bags for protectors, though I have seen a light woven fabric of horse hair, which I should think would be preferable. The strongest equally swelled bunches should be chosen, and freed from small and decayed berries before bagging.—*Corresp. Gard. Mag.*

To flower Mignonette during Winter and Spring.—To flower in November, sow August the 10th. To flower in the end of January, and throughout Febuary, sow August the 25th. To flower in March, April, and May, sow September the 5th. Sow in 48-sized pots, with their bottoms safely drained in a compost of two fourths mellow loam, one fourth leaf mould, and one fourth clean sand. Plunge in frames within a foot of the glass, give the frame a good elevation, and thin the plants out to six or seven in a pot. Give all the air possible, when not frosty, but mat up well in severe weather. It is advisable to stop the middle shoot from the two latter sowings. At all times, except when flowering, give water with caution.—*Ib.*

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Orange Trees.—The principal feature at Mr. Pugh's villa, at Rouen, in France, is a collection of large orange trees, some of them with their boxes above seventeen feet high, and it is estimated, that they must be at least several centuries old, since the fathers of old persons still alive recollected that in their youth the trees were much of the same size as they are at present. There are a hundred of these venerable and beautiful trees, set out at regular distances, in a square hedged enclosure laid with gravel. In winter the trees are kept in a barn-like building, 85 ft. long, 30 ft. wide, and 18 ft. high, with a few small windows, and a large carriage-entrance in one end. They are taken out and in by Vallet's diable machine with one horse and three men; and each box, which is 4 ft. square, outside measure, is with this power lifted up or set down in exactly two minutes. Two men will work the machine, but not so well as three; and four render the work so perfect in point of rapidity, that the whole of these 100 heavy boxes may be taken in or out in one day. The materials of the boxes are oak or chestnut, which, when well painted, last thirty-five years. These 100 trees, in 1823, produced 1,400 lbs. of blossoms, which sell, on an average of years, at 3 *fr.* per lb., to the apothecaries and confectioners, and to private families who distil their orange-water. This sum of 4,200 *fr.* is supposed to pay something more than the expense of keeping these trees, a circumstance which will account for the number of orange trees in France.—*Ib.*

Fruit Trees.—Wall and espalier trees often become naked for a foot or two on each side of the main stem; but by ringing the lateral branches at 6 or 8 in. distance from the main stem, young shoots will be thrown out between the ring and the stem, which may be trained over the naked parts with pleasure.—*Ib.*

Canker in Apple Trees.—Take fresh cow-dung, quicklime, and wood ashes, of each an equal quantity: to them add a little sulphur, with a sufficient quantity of urine to make it of the consistence of paint; and, having mixed the whole well together, then, with a painter's brush, wash the trees well, taking care not to miss any of the parts which are infected.—*Ibid.*

Ants on Peach Trees, are not the cause but effect of injury. Before the ants become troublesome the trees are infested with the Aphis, *puceron,* which produce what is commonly called honey-dew, and which is their excrement, to which the ants resort for food. To destroy the Aphis frequently syringe the trees with water mixed with a strong decoction of potato haulm and elder leaves, which is found to be most effectual. As a bait for the ants, use the refuse part of melons, sent from the table of the family; when this is not to be had, turnips cut and rubbed over with honey; by which thousands may be taken.—*Gard. Mag.*

Prùnus Laurocérasus.—The distilled water of this plant, (*Black Cherry Water*) the virtues of which depend on the prussic acid that it contains, is a deadly poison, taken internally, or applied to wounds. The oil of laurel is also a virulent poison. Like various other poisons, it is considered an important medicine. It is a narcotic, but has not the property of lessening pain, nor of procuring sleep, like opium; nor of controlling the pulse like digitàlis; but it soothes the stomach when in a state of morbid irritability.—*Ib.*

Dahliahs (now Georginas).—A good criterion for planting this root is about the time of planting early potatoes for a first crop, but no sooner. They grow well in a rich light soil of almost any kind. In dividing the root, it is advisable to leave, at least, two eyes to each plant, cutting

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through the neck or crown; the spring is the most preferable time for dividing them, although some do it on taking them up in the autumn. Those who possess a hot-house should put each part into a pot of 6 or 8 inches in diameter, with some good rich mould, so as the crown may just appear at the top of the pot; then place them in the green-house, where they will soon make good plants; and, when all danger from frost is over, they may be turned out into holes prepared for them.—*Gard. Mag.*

Ripening Fruit.—Slates have recently been employed in France for hastening the ripening of fruits. The effect was first observed on a slate oof; since which the slates have been placed beneath the fruit on walls.

An Apple Tree at St. Valery, in France, owing to the imperfect organization of its blossoms, never bore fruit till last year, when the owner impregnated the bloom with the pollen of the blossoms of other trees. All the blooms so treated produced fine fruit, whilst those which were not brought into contact with the blossoms from other trees remained, as formerly, barren.

Transplanting Shrubs in full growth.—Dig a narrow trench round the plant, leaving its roots in the middle in an isolated ball of earth; fill the trench with plaster of Paris, which will become hard in a few minutes, and form a case to the ball and plant, which may be lifted and removed any where at pleasure.—*French Paper.*

Enlargement of Artichokes.—The gardeners in the south of France increase the size of artichokes by splitting the stem into four at the base of the receptacle, and introducing two small sticks in the form of a cross. This operation should not be made until the stem has attained the height it ought to have.—*From the French.*

Preservation of Peach Trees.—To prevent worms from injuring the trunks of peach trees, heap a quantity of clay or compost round the roots, mixed with a little lime, marsh, or mud, while they are in the wood, that they may be suffocated before the fly can escape.—*Southern Patriot.*

Dead Leaves a Protection to the Roots of Vegetables.—Place heaps of fallen leaves around the roots of garden vegetables, to protect them from too great humidity, more hurtful to them than the cold, since they are more liable to decay with the damp than to freeze. Some leaves possess, in a greater degree than others, the power of throwing off the wet: the leaves of the oak are endowed with this quality in an extraordinary degree; tender leaves, on the contrary, such as those of the lime-tree, admit the wet more easily.—*From the French.*

Water Cresses.—A dangerous plant grows, mixed with water-cresses, in springs and streams: when not in flower, it so much resembles the latter as not easily to be distinguished, except by a botanist. Water-cresses are of a deeper green, and sometimes spotted with brown, and the extremities of the leaves are more brown, and especially the last leaves, which are in pairs larger than the others, and undulated at their edges. The dangerous plant, or water-parsnip, as it is called, is of an uniform green, the ends of its leaves are longer and narrower, conical at the extremities, and toothed at the edges. The best method of knowing them well is to examine them in July, when the flowers are expanded, and when they may be thoroughly distinguished.

Improvement in Gooseberries.—The heaviest gooseberries known fifty years ago seldom exceeded 10 dwts. In the neighbourhood of Manchester, the poor people, by continued experience and perseverance, in raising new sorts, with all the disadvantages attending their situation in life, have brought the fruit to from 10 to upwards of 30 dwts.—*Gard. Mag.*

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Pruning.—The knife should be used as sparingly as possible: it is as injurious to trees as the lancet is to animal life. In proof of this, consider the common thorn confined in a hedge, where it is annually clipped, and the shrub in its primitive growth.—*Gard. Mag.*

Training Trees.—It is preferable to use shreds of cloth to any other mode that is practised for training trees, as they form harbours for insects through the winter, and afford a good opportunity for the insects and eggs of insects to be removed with the shreds, and destroyed with boiling water.—*Major's Treatise.*

Keeping Fruit.—Mr. M'Intosh approves of sweating kitchen fruit, to get rid of a part of their moisture. The practice "is probably no detriment to the fruit, and must certainly contribute to its keeping." Table fruit "we keep in strong boxes filled with dry sharp sand, in which the fruit is packed, and secured in a dry room, and as much excluded from the air as possible. By this means, the better keeping apples and pears will keep till April and May, and some will keep till June. However, it is probable that fruits packed in charcoal, or very dry bog-mould, may keep much longer."

At the *Caledonian Horticultural Society,* recently, some apples of crop 1827, in good preservation, although fifteen months off the tree, were exhibited by Mr. George Watson, gardener at Tarvit, near Cupar, Fife. These apples were of the variety called the Kerry Pippin; and the mode of preserving them consisted in placing them apart from each other in flat-bottomed earthen jars, with air-tight covers, layers of fine dry sand being put between them, and the jars kept in a cool dry situation.

Alternation of Garden Crops.—1. Broccoli, cabbage, cauliflower, and savoys; 2. common beans, French beans, and peas; 3. carrots, beets, and parsnips; 4. Turnips, early potatoes, onions, leeks, eschalots, &c.; 5. celery, endive, lettuce, &c. &c.—It is found in practice that celery constitutes an excellent preparation for asparagus, onions, and cauliflowers. Turnips or potatoes are a good preparation for cabbages, or greens. Broccoli or cabbages are a proper preparation for beans or peas. Cauliflowers prepare well for onions, leeks, or turnips. Old asparagus land affords a good preparation for potatoes or carrots. The strawberry, currant, gooseberry, and raspberry, for the same. Turnips give a suitable preparation for celery or endive; and peas, when well manured, are a good preparation for spinach, &c.—*M'Intosh's Gardener.*

Rhubarb.—The use of this article in the kitchen within the last few years has increased to a very great extent, and has induced many gardeners in the neighbourhood of London to turn their attention to its improvement, whence have resulted several new varieties, among which may be particularly noticed Wilmot's Early Red, Radford's Giant, Dutly's Goliath, and Myatt's Seedling. The first is an early variety for forcing; the others are large and well flavoured, and equally desirable and advantageous, giving a large supply of fine stalks at this season for the table. Rhubarb stalks were first used as a substitute for, or mixed with, gooseberries or apples in tarts; but they are now esteemed for their peculiar flavour, without reference either to gooseberries or apples, and generally considered wholesome and nutritive.

Lemons and Oranges.—Mr. Skey, of Spring Grove, near Bewdley, Worcestershire, has sent us some very fine lemons of his own growing. One of them weighs 11 oz., and two others nearly as much, and the whole are well-formed fruit. Mr. Skey mentions that he gathered last year 65 dozen of lemons, and 45 dozen of oranges.—*Gard. Mag.*

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Growth and Preparation of Tobacco.—Sow in a hot-bed about the middle of March, transplant in small pots, and shift two or three times till the latter end of April. Transplant in a sheltered situation on light rich soil, at 2 ft. apart every way. In autumn, when the lowest leaves are beginning to assume a yellowish hue, take them off, tie them in bundles of half a dozen, and hang them up to dry; in a fortnight a second gathering will be ready. When all the gatherings are dried, pack them together, straight and close, "so as to produce perspiration, like what is necessary for new hay.......If a sufficient quantity cannot be got at one time to produce perspiration of itself, it may be greatly aided by packing it in a box, closing it up, and then covering overhead the whole box in a heap of weeds, grass, or manure that is in a gentle heat After sweating a week or ten days, it may be kept in a moderately dry situation, so as to prevent its moulding."—*Major's Treatise.*

It was known to few (even commercial men) that tobacco is extensively planted in Ireland; but there is no doubt of a quantity having been grown and saved last year, on which the crown did not receive one farthing of duty, but which, if foreign and imported, would have yielded 140,000*l.* to the revenue. No duty is attachable to Irish grown tobacco; but there are great doubts as to its legality of sale, and therefore it is conveyed under covered permits. The growth is absolutely interdicted in England. Now, that the prohibitory laws are no longer necessary, it becomes of immense importance to institute inquiry, whether all the tobacco used in Great Britain may not be obtained in Ireland, without giving a preference to our rivals in the United States of America? We have before said, that the growth in Ireland, last year, was, as to revenue, to the value of 140,000*l.*; and we are informed, that so profitable is its cultivation, that, in a very short period, a quantity to the extent of 700,000*l.* revenue (or rather sacrifice of revenue) will be raised in one year.—*Liverpool Chronicle.*

Tobacco Water.—It will require not less than a pound of the leaves to a gallon of water to make good tobacco water; and in order to obtain the whole of the virtue of the tobacco, it will be proper to let the water be poured over the leaves in a boiling state. The liquid may remain covered up a few hours, or till wanted for use. Before it is used the leaves must be taken out, taking care to have the whole water squeezed from them. Any quantity that is necessary may be made at a time, as it will be no worse for keeping, especially if kept air-tight.—*Major's Treatise.*

Cottage Gardens.—The comforts and benefits to be derived from a well cultivated garden, by a poor man's family, are almost beyond calculation. What a resource for hours of work, or when trade is dull, and regular work scarce! What a contrast and counteraction is the healthy manly employment which a cottage garden affords, to the close, impure, unwholesome air, the beastliness and obscenity, the waste of time, the destruction of morals, the loss of character, money, and health, which are the inmates of too many common ale-houses!—*Ed. Gard. Mag.*

Culture of Roses.—By M. Vibert, nurseryman, formerly of Chenervieres, now of Saint Denis—Watering the plants during summer is enjoined as essential to success; even the stocks for budding on should be kept well watered, to ensure strength of shoots. The month of June is the proper time for budding, provided the weather is not too dry; cloudy weather, and on mornings and evenings, are the most suitable times of the day for that operation. M. Vibert advises a summer regulation of the shoots, by disbudding, pinching off the tops of over-luxuriant shoots,

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of the stocks, as well as of the worked plants. Even the footstalks of the faded flowers, he says, should be cut off, as a means of encouraging the general growth of the plant. Stopping the shoots, from which buds are intended to be taken, strengthens the bud, and is a good practice, especially with such sorts as the Provins. Frequent watering greatly assists the striking of layers. Shade the more delicate sorts, or keep them in north aspects.—*Gard. Mag.*

Wash for Aphides.—Boil in six or eight parts of water, two parts of quicklime, and one part flour of sulphur, for a quarter of an hour; then strain through a hair sieve; when it is ready for use. It should be always well shaken before it is used.—*Ibid.*

To destroy Mole Crickets.—Place fresh sods or turves on the beds or borders of the garden where any traces of the insects are seen. These turves, being well watered over night, attract the insects to hide under them, where they may be easily caught in the morning. This scheme persisted in, will soon rid any place infested with them, especially during the months of April, May, and June.—*Ibid.*

Apples.—At La Grange, in France, an orchard of ten thousand apple-trees has been substituted for the vines of an old vineyard, on strong clayey soil. On such a soil, the cider of the apple, properly prepared, is superior to the wine of the grape.—*Ibid.*

Fontainebleau Grapes.—The superiority of the Fontainebleau grapes is attributed to the following peculiarities of practice, to which we would add the spur method of pruning:—

1st. To the judicious choice of cuttings, the vignerons never making use of any but such as have borne the best and finest fruits.

2nd. By planting the vines at a distance from the wall, and by frequently laying the shoots until they reach the wall, the vines acquire abundance of roots upon the surface. Also, by the close planting, from which all undue luxuriance is restrained; by this means the branches complete their growth within the bounds prescribed, and ripen their wood early.

3rd. By limiting each plant to only one cordon, with two arms, right and left, the entire extent of both not exceeding eight feet. The energies of the roots, confined to so small a space, nourish the bearing wood more effectually and more equally, and bring the fruit to greater perfection.

4th. To the projecting coping, which protects the vine and fruit from frosts and heavy rains, and intercepts and retains the heat radiating from the surface of the wall and of the soil.

5th. The sloping disposition of the ground also contributes to their success, as it prevents any accumulation of moisture at the roots of the vines, and preserves them sound and healthy.—*From the French, in Transactions of the Horticultural Society.*

Attar of Roses.—Ghazedpon is celebrated throughout India for the beauty and extent of its rose gardens; the rose fields occupy many hundred acres; the roses are cultivated for distillation, and for making attar. The price of a sieve, or two pounds weight (a large quart,) of the best rose-water, is eighteen linas, or a shilling. The attar is obtained after the rose-water is made, by setting it out during the night, until sunrise, in large open vessels, exposed to the air, and then skimming off the essential oil which floats on the top. To produce one rupee's weight of attar, 200,000 well-grown roses are required. The juice, even on the spot, is extravagantly dear, a rupee's weight being sold at the bazaar

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(where it is often adulterated with sandal-wood oil) for 80 *s. r.*, and at the English warehouse for 100 *s. r.*, or 10*l.* sterling. Mr. Melville, who made some for himself, said he calculated that the rent of the land, and price of utensils, really cost him 5*l.* for the above quantity.—*Bishop Heber's Narrative.*

Indian Cress—a new salad.—Three or four years since some grains of Indian cress (*sisymbrium indicum*, Linn.) were sent from the Isle of France to the Jardin du Roi, and having multiplied exceedingly, were tried as salad for the table, and have been judged of very favourably, in consequence of their power of yielding salad during the winter. The qualities which render this cress desirable for cultivation in our gardens, as a salad, are— 1st. That it is eminently antiscorbutic and depurative; 2nd. That its leaves are more tender and less acrid than those of other cresses, used as salads; 3rd. That it does not suffer from the hardest winters; does not require watering to ensure or favour its growth; and will supply leaves during the winter, and especially in spring. It is necessary that the seed should be sown in ground in which none have been grown for some years preceding: its culture does not differ essentially from that of the corn salad.—*From the French.*

Iron Hot-houses—heating by hot water.—The heating of hot-houses and fruit-walls by means of hot water conveyed through tubes, instead of smoke flues appears to be coming into fashion. The principal advantage is a more equable temperature, dispersed through the whole range of the influence of the heating process. At Woburn Abbey are iron hot-houses, heated by hot water. From observations on a pine stove of this description, as to what it would lose in heat between eight o'clock in the evening and eight o'clock in the morning, in one of the coldest nights in January last (the 25th), it was ascertained, that at eight o'clock in the evening the thermometer in the open air stood at 13 deg., that in the pine stove after the fire was made up for the night at 65 deg., and next morning at 55 deg. The temperature of the atmosphere in a wooden house, as compared with that of an iron house, in neither of which there was any artificial heat, was ascertained, when that of the iron house was 3 deg. higher than the other, owing, as it was conjectured, to the lapse of the glass being puttied in the iron house. At any rate the loss of heat, by the conducting qualities of iron is but small. Not a single pane had been broken in these iron houses, either by contraction or expansion.

Preservation of Grapes for Winter Consumption.—The vine to be grown in hot-houses, but without fires, except in the autumn, when the damp season begins. At that period the flues should be heated at about nine or ten o'clock in the morning, admitting air at the same time. After twelve o'clock no more fire should be lighted, and the glasses should be closed air-tight. These proceedings should be continued as long as any grapes remain. The simultaneous action, during the day, of the fire and the air prevents the entrance of any humidity. Should the flues be heated during the night, when it is required to keep the hot-house closed, the vapour would produce dampness. In this manner grapes have been kept in good preservation until the beginning of February.— *From the French.*

Gravel Walks.—When a new walk is made, or an old one reformed, take the necessary quantity of road scraping, previously dried in the air, and reduced as fine as possible; mix with the heap enough of coal-tar from a gas-work, so that the whole shall be sufficiently saturated, and then add a quantity of gravel;—with this lay a thick stratum as a foundation, and then cover it with a thin coating of gravel. In a short time

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the walk will be as hard as a rock, not affected by wet, or disfigured by worms.—*Register of Arts.*

DOMESTIC ECONOMY.

To dress the Roots of Celeriac or Celerie Rave.—The following is considered a cheap and an elegant mode :—Pare the roots, and cut them into slices somewhat less than a quarter of an inch in thickness; then boil them gently till they are tender in some broth, or in water well seasoned, and a slice of butter added. When dished, pour over them some melted butter, or *bechamel* sauce, which is made by thickening some broth, and adding a little cream. Celeriac is cultivated at greater ease and at less expense than the common celery, and it may be used in the kitchen for seven or eight months in succession.—*Gard. Mag.*

French method of making superior Gooseberry and Currant Wines.—For Currant Wine: Eight pounds of honey are dissolved in fifteen gallons of boiling water, to which, when clarified, is added the juice of eight pounds of red or white currants. It is then fermented for twenty-four hours, and two pounds of sugar to every two gallons of water are added. The preparation is afterwards clarified with the whites of eggs and cream of Tartar.——For Gooseberry Wine: The fruit is gathered dry when about half ripe, and then pounded in a mortar. The juice, when properly strained through a canvass bag, is mixed with sugar, in the proportion of three pounds to every two gallons of juice. It is then left in a quiet state for fifteen days; at the expiration of which it is carefully poured off, and left to ferment for three months, when the quantity is under fifteen gallons, and for five months when double that quantity. It is then bottled, and soon becomes fit for drinking.—*Ibid.*

To remove Spots from Cloth.—The soldiers in garrison at Maubeuge have, for some time past, for the purpose of removing stains from their clothes, made use of a water composed from the following receipt:—Pour a quart of warm water into a glazed earthen pan, and add a small quantity of white soap, and an ounce of powder of kali of Alicant; when this is thoroughly dissolved, add two spoonsful of ox-gall, and a little essence of lavender; let the whole be well stirred, and strained through a linen cloth, and kept in a bottle. In making use of it, a small quantity is to be placed with care on the spot, which is to be rubbed with a small brush, then washed with warm water, so as to remove all vestiges of the liquor applied, which might injure the cloth if allowed to remain.—*From the French.*

Kneading Bread by Machinery.—A company has been established in Paris, in the Faubourg St. Antoine, to supply the metropolis with pure bread. Among other improvements adopted by this Society is that of kneading the dough by means of steam machinery. This substitution for the working of the bread by manual labour, besides the greater cleanliness of the process, has the further advantage of allowing yeast to be dispensed with—the additional power of the machine being sufficient to give the bread its proper degree of lightness without any foreign aids. The capital of the company is divided into 4,000 shares of 1,000 francs each.—*Bull Univ.*

To clear Feathers of their Animal Oil.—A lady (Mrs. Richardson) has received a premium of twenty guineas, from the Society of Arts, for the

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following recipe for cleaning feathers:—"Take for every gallon of clean water one pound of quick lime, mix them well together, and, when the undissolved lime is precipitated in fine powder, pour off the clear lime-water for use. Put the feathers to be cleaned in another tub, and add to them a quantity of the clear lime-water, sufficient to cover the feathers about three inches, when well immersed and stirred about therein. The feathers, when thoroughly moistened, will sink down, and should remain in the lime-water three or four days; after which the foul liquor should be separated from them by laying them in a sieve. The feathers should be afterwards well washed in clean water, and dried upon nets, the meshes of which may be about the fineness of cabbage-nets. The feathers must be from time to time shaken on the nets, and as they dry will fall through the meshes, and are to be collected for use. The admission of air will be serviceable in the drying; the whole process will be completed in about three weeks. After being prepared as above mentioned, they will only require beating, to get rid of the dust, previous to use.—*Register of Arts.*

Potato Flour and Arrow-root Flour.—Potato flour may be known from arrow-root flour by rubbing a little of it between the finger and thumb, when it will be observed that the potato flour is softer to the *touch*, and more shining to the *sight*, than that from the arrow-root. The mucilage or jelly formed with boiling water is in both cases alike, though some good women make serious charges against one or the other, namely, that they "*turn to water.*" This effect we can tell them does not take place unless sugar is put to the solution; for although water has a great affection for starch, it likes sugar better, and if left alone will gradually steal away to the latter.—*Ibid.*

To cure Mutton Hams.—The mutton for the purpose should be very fat. Mix two ounces of raw sugar with an ounce of common salt pounded, and half a table spoonful of saltpetre; rub the ham with this mixture, and place it in a pan; beat it and turn it twice a day for three successive days, at each time throwing away the brine which exudes from the meat. Then wipe it, and rub it again with the mixture as before; on the morrow beat and turn and wipe it as before, performing these operations until ten days have elapsed, taking care on leaving it after each new salting to have that side uppermost which was undermost before. Let it be then smoked for about ten days.—*From the French.*

Cream Gauge.—A cream gauge is a glass tube, exactly cylindrical, of about one inch in diameter, and 10½ inches long. On its outside is a graduated scale, 3 inches long, and each inch is divided into ten equal parts. The scale commences at exactly the height of 10 inches from the bottom of the tube: it is numbered, and counts downwards. Being filled up to 10 inches high with new milk, of a proper temperature, it is set by in the dairy for twelve hours, in which time the cream will all of it have risen to the top of the tube, if the cow be a proper one from which to make butter.—*Waistell on Agr. Build.*

Cure for Ringworm and Tetters.—Dr. Reinhardt, of Mülhausen, recommends the use of a solution of borax in water as a cure for scurvy tetters. He affirms that he has adopted this remedy with great success in the course of his practice: he first used it in his own case, having a complaint of the kind on his hands. The application produced at first a burning sensation, with redness; and it was discontinued for some days and resumed, and the disorder gradually disappeared. In three similar cases the same cure

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was adopted with equal success. In one instance on an old man 60 years of age, who had been suffering the inconvenience for several years.—*From the German.*

Preservation of Clothes from Moths.—Camphor, pepper, cedar-wood, savine, &c., used by some housewives to keep moths from clothes, are perfectly useless if the clothes are not frequently taken out, brushed, and aired; and if clothes are taken out frequently, and brushed and aired, no camphor or other ingredient is necessary to keep them from the moth, or other insects. To convince himself and others of the uselessness of camphor and other nostrums alone, M. Vinet has hatched moths in an atmosphere impregnated with camphor and the other substances mentioned.—*Mag. Nat. Hist.*

New sort of Coffee.—According to a report by M. Pajots Descharmes, on the authority of a person who had constantly made the experiment for twelve years, the seeds of the broom form an excellent substitute for coffee. Being moderately roasted, ground, and prepared in the manner of ordinary coffee, this person finds no difference between it and coffee. It is not the garden but the forest broom, the seeds of which are to be taken for this use.—*From the French.*

Recipe for Cedrat Water.—Three kilograms of white sugar are to be dissolved in seven quarts of river water; then add 3½ pints of spirit of cedrat, and 1¾ pints of spirit of citron; make the whole boil for a minute, and filter it, while hot, through a straining-bag (chausse); receive the liquor into a vessel of earthenware, and change the vessel as soon as it no longer passes clear. When it becomes cold, put it into large bottles, and do not open them until a considerable time afterwards.—*Ib.*

To make Oil or Cream of Cedrat.—Seven quarts of river water, 1¾ pints of spirit of cedrat, and add as much syrup of sugar as will soften the liqueur to the necessary degree, to give it a clammy consistence; then agitate or stir it well with a spatula, to make the combination perfect, and put it into bottles, which must remain for a considerable length of time unopened. If the liqueur should become a little turbid, it must be filtered through paper, or better through a filter made of fustain, suspended in a funnel of tinned sheet iron, closed by a movable cover.—*Ib.*

To remove Grease Spots.—Take the yolk of an egg and put a little of it on the spot, then place over it a piece of white linen, and wet it with boiling water: rub the linen with the hand, and repeat the process three or four times, at each time applying fresh boiling water: the linen is to be then removed, and the part thus treated is to be washed with clean cold water.—*From the French.*

Method of cleaning Silk, &c.—Take raw potatoes, wash them, grate them to a pulp over water; pass the liquid through a coarse sieve into another tub of clear water; let the mixture stand until the fine white particles (or starch) are precipitated; then pour off the liquor for use. Lay the article to be cleaned over a linen cloth upon a table, and with a sponge dipped in the potato liquor, wet and rub the article to be cleaned, repeating the affusion till the dirt is loosened; wash the article in clean water repeatedly; then dry and smoothen. Two middle-sized potatoes are sufficient for a pint of water. The white powder, or starch, separated from the liquor at the bottom of the tub, after being washed by repeated affusions of water, forms an excellent substitute for tapioca, as a nourishing food with soup or milk. The coarse pulp which does not pass the sieve is of great use in cleaning worsted or woollen curtains, tapestry, carpets, or other coarse goods. The liquor cleans the finer

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kinds of silk, cotton, and woollen goods without injury to the texture or colours. It is also useful in cleaning oil paintings, or soiled furniture. Dirty painted wainscotting is also effectually cleaned by wetting a sponge in the liquid, and rubbing it with a little fine sand over the wainscot.—*Register of Arts.*

Dried Apples and Pears.—The apples and pears which arrive here in a dried state from France, are thus prepared. The fruit is put into boiling water, in which it is left until it becomes soft. It is then taken out and carefully peeled, the stalk being left on. To prevent any loss of juice, it is placed on a strainer, under which is a dish. When peeled, it is put into an oven heated to the ordinary temperature for bread, and left there twenty-four hours. When taken out and cold, the fruit is pressed flat between the hands; and after being plunged into its own juice, which has been set apart for that purpose, it is packed in boxes and exported.—*Lit. Gaz.*

To preserve Butter.—Instead of using common salt, take a mixture composed of one part of sugar very finely powdered, one of purified nitre, and one of purified sea salt. An ounce of this mixture is to be put to each pound of butter, and well worked in: when this is done, the butter should be put into crocks, and carefully covered over with parchment.

To preserve Grapes.—Take a well-bound cask, from which the head is to be removed, and place at the bottom a good layer of bran. On this place a layer of grapes, then bran and grapes alternately until the cask is full, taking care that there is sufficient bran between each layer of grapes to prevent their touching each other. Put on the head, which is to be cemented, and the grapes will keep well for a year. When used, in order to restore their freshness, cut the stalk of each bunch, and place it in wine, as flowers are placed in water.—*From the French.*

French Wines.—The consumption of French wines in France has (very naturally) increased with the increase of national wealth. In 1821, the quantity retailed, and of course chiefly consumed by the lower classes, scarcely amounted to 12,900,000 hectolitres; in 1826, it exceeded 15,400,000. The quantity sold wholesale, and consequently consumed by families of opulence, or at least in easy circumstances, exhibits a still more strongly marked progress. In 1818, in was 2,665,948 hectolitres; in 1826, it amounted to 3,973,482; and in 1828, to 5,264,209.

Cement for China, &c.—Put an ounce of mastic in a sufficient quantity of spirits of wine to dissolve it; then take an ounce of isinglass, soak it in water until it is soft, and dissolve it in brandy till it becomes a strong jelly, adding afterwards an ounce of well-powdered gum ammoniac. Put the two mixtures together in an earthen pipkin, and expose them to a gentle heat; when they are well mixed pour them into a bottle, which is to be well corked. To use this cement the bottle is to be placed in hot water until it is sufficiently fluid—it is then to be applied to the fractures in the usual way. In twelve hours it will set, and the mended part will become as hard as any other.—*From the French.*

Lamp Glasses.—A very simple but effective precaution is employed in Paris, to prevent the breaking of lamp-glasses by the sudden application of heat. Before they are used a glazier cuts or scratches the base of the glass with a diamond, and afterwards sudden heat may be applied without danger.—*Ibid.*

Imitation Cyprus Wine.—Some of the leading restaurateurs in Paris sell, at the rate of two or three francs per glass, a wine which they call

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Vin de Chypre; and many John Bulls believe that they are really drinking Cyprus wine. It is, however, only an imitation; the mode of preparing which is thus given by the *Bibliothèque Physico-Econom.* To ten quarts of the syrup of elderberries add eighty pints of water. Press the berries gently, and add two ounces of ginger and one ounce of cloves. Then boil altogether for an hour. After skimming it well, pour it into a vessel, and add one pound and a half of bruised grapes, which are to be left in it until the wine has acquired a fine colour.

Apples for Keeping—The *Golden Reinette* is one of our best winter fruits, being very hardy, a great bearer, keeping well till March, and retaining its beauty, along with its fine aromatic subacid flavour, till the very last.—*Pomological Magazine.*

The Old Nonpareil is perhaps the most general favourite with persons of every taste, on account of its peculiar, agreeable, brisk flavour, and the length of time it keeps.—*ib.*

The Foreman's Crew Apple is one of the best table apples we have, combining the excellence of the Old Golden Pippin and Nonpareil. It keeps as late as any variety we know, and the tree is among the most healthy.—*Ib.*

To make Kitchen Vegetables tender.—When peas, French beans, and similar productions, do not boil easily, it has usually been imputed to the coolness of the season, or to the rains. This popular notion is erroneous: the difficulty of boiling them soft arises from a superabundant quantity of gypsum imbibed during their growth, To correct this, throw a small quantity of subcarbonate of soda into the pot along with the vegetables, the carbonic acid of which will seize upon the lime in the gypsum, and free the legumes, &c., from its influence.—*From the French.*

To prepare Verjuice for bottling and keeping.—Express the juice of unripe grapes or gooseberries, without bruising the seeds, which would give a disagreeable taste to the liquor. Strain the juice through a linen cloth; bottle it, and expose it, uncorked, to the sun for six or seven days. The liquor will ferment, and a part will be lost in froth, which must be replaced every morning. When the fermentation has ceased, decant the liquor into other bottles, cork them, and place them in the cellar for use. In this way, the juice of any sour fruit as the citron, crab, &c., may be preserved, and no expense of sugar incurred till the moment it is to be used. Verjuice is much used in France as a summer beverage; a little syrup or sugar is mixed with a small part of it, which is then well shaken, and afterwards poured into a glass, and filled up with water. Gooseberry verjuice is commonly used; and, when mixed with sugar, it is sold by the confectioners of Paris, under the name of Sirope de Groseilles (*Gooseberry Syrup.*) Any gardener or cottager might make it for himself.—*Ib.*

Bread of the Shetland and Orkney Islands.—Over these islands, with the exception of the capital towns of Kirkwall and Lerwick, the superior classes are compelled to bake their own bread, and this they do in great perfection without the assistance of yeast. Their method, which is as follows, may be adopted with great advantage in countries where yeast is difficult of attainment:—Mix two pounds of mashed potatoes with a table-spoonful of yeast (or double the quantity of porter,) two table-spoonsful of flour, and a table-spoonful of salt; beat these ingredients well together, adding as much lukewarm water as will reduce the composition to the consistency of batter. Let it stand for

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twenty-four hours in a closely covered earthenware jar, when it will be fit for use. For every pound of flour to be baked, take four table-spoonsful of the composition: mix up two thirds of the flour, adding a little lukewarm water or fresh cream, then knead the remainder of the flour into the mass of dough; give it the desired shape, and let it stand four hours covered with a large dish, before it is put into the oven. Replace the composition by an equal quantity of mashed potatoes, flour, and salt, in the proportions stated above; and beat the whole together in the jar, having first poured off the liquid collected at the bottom of the vessel. Let the jar be kept well covered, in a warm place in winter, and a cold place in summer. The loaves or rolls may not rise well on the first or second attempt; but after a few repetitions, they will be found superior to any baker's bread, and the composition, if daily renewed according to the directions, will continue for years to improve in quality.—*From Dr. Howison's MS. Notes.*

Consumption of Beef in France.—From M. Lullin De Chateauvieux, it appears that the consumption of beef in that country relative to the population, is only one-sixth of what it is in England, notwithstanding that, during the year 1826, no fewer than 36,518 oxen and cows were imported from foreign countries. The number of horses and colts imported the same year was about 14,000, and that of sheep and lambs upwards of 200,000.

To Preserve Fruit without Sugar. -You must use wide-necked bottles, such as are used for wine and porter. Have the bottles perfectly clean. The fruit should not be too ripe. Fill the bottles as full as they will hold, so as to admit the cork going in. Make the fruit lie compact; fit the corks to each bottle, slightly putting them in that they may be taken out the easier when scalded enough; this may be done in any thing which is convenient; put a coarse cloth of any kind at the bottom of the vessel, to prevent the bottles from cracking; fill the vessel with water sufficiently high for the bottles to be nearly covered in it; turn them a little to one side to expel the air that is contained in the bottom of the bottle; then light the fire; take care that the bottles do not touch the sides nor the bottom of the vessel, for fear they will burst, and increase the heat gradually, until the thermometer rises to 160 or 170 deg. If such an instrument cannot be procured, you must judge by the finger; the water must not be so hot as to scald. It must be kept at that sufficient degree of heat for half an hour; it should not be kept on any longer, nor a greater heat produced than above mentioned. During the time the bottles are increasing in heat, a tea-kettle of water must be ready boiled as soon as the fruit is done. As soon as the fruit is properly scalded, take the bottles out of the water one at a time, and fill them within an inch of the cork with the boiling water. Cork them down immediately, doing it gently but very tight, by pushing the cork in, for agitation will be apt to burst the bottles; lay the bottles on the side, to keep the air from escaping. You must take care to let them lie on their sides until wanted, often turning them over, once in a week, or once in a month.—*American Journ. of Arts and Sciences.*

Gelatine.—The use of gelatine from bones is becoming very general in the French hospitals as an article of diet. In the hospital of La Charité, in Paris, upwards of 1,000 rations a day are produced by means of a steam apparatus. This gelatine is said to be much liked by the patients, as it is pure, and may be flavoured in any way that is desired.—Gelatine is also getting into use in the domestic economy of the work-

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ing classes. It appears that sixty persons belonging to the Royal Medal Mint, had good soup provided for them from gelatine for one franc eighty cents, being little more than a farthing per head; and that a *ragoût* of potatoes, made also with gelatine, for the same number, cost only two francs sixty cents, not quite one halfpenny each. It is calculated that a workman may, by the use of gelatine instead of meat, reduce his expenditure nearly one half; and instances are mentioned in which a much larger economy than this has been effected, with an improvement in the bodily strength of the workmen, owing to the greater nutrition of this kind of food.—*Lit. Gaz.*

To preserve Apples and Pears.—Wipe the fruit dry, then take a varnished crock or wide-mouthed jar, at the bottom of which is to be a layer of fine and very dry sand; on this place a layer of fruit, and so alternately fruit and sand until the crock or jar is full. Put a very thick coat of sand on the top, and place it in a dry place. Apples or pears thus treated will keep good all the winter.—*From the French.*

Ratafia of Grapes without Sugar.—Take the sweetest grapes, and put them into a bottle without the stalks, with good French brandy. Cork the bottle, and leave them to infuse during a fortnight. At the expiration of this time pour out the grapes and brandy into a dish; bruise the grapes, and pass the whole through a close cloth. Put the liquor into a glass bottle well corked, adding a little cinnamon and some peach-kernels, and leave it for another fortnight, when it is to be poured clear off, or clarified in the usual way.—*Journ. des Connais. Usuelles.*

Jelly from Grapes.—Take the ripest grapes and spread them on clean straw; at the end of a fortnight pluck them from the stalks, and boil them for five or six minutes, in order to be able to extract the juice with ease: after passing the juice through a sieve, add a quarter of a pound of white sugar to each pound of juice, and boil for half an hour. Then set to cool; and in twenty-four hours there will be a fine jelly, the properties of which are excellent for invalids.—*Ib.*

To make Kirch-wasser.—This celebrated liqueur, which in Switzerland is the brandy of the country, is made from the fruit of the small cherry-tree (merisier). When the cherries have arrived at maturity, they are gathered without the stalks, and pounded in a large wooden vessel, their kernels not being broken to prevent evaporation. When fermentation has begun, the liquor is stirred two or three times a day; and as soon as the wash appears quiet, it is put into close barrels, to prevent acetous fermentation. The kernels being then broken, they are thrown into the liquor, and the whole is carefully distilled together. The best kirch-wasser is made from the small black cherries of the kind which abounds in this country.

Sciatica.—Oil of turpentine has been employed in France in the treatment of sciatica with great benefit to the patient.

Warts and Corns.—It is stated that the bark of the willow tree, burnt to ashes, mixed with strong vinegar, and applied to the parts, will remove all warts, corns, or excrescences, on any part of the body.

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USEFUL AND ORNAMENTAL ARTS.

Sculpture.—Mr. Allan Cunningham, it is stated, has remarked, that if the instrument by which marble busts, &c. are modelled after the clay, be placed in inverse or other positions, it may still be used, and with this advantage—that it will alter the attitude of the bust or statue, and make it look any way, instead of being always the same in a hundred copies. —*Lit. Gaz.*

Dry Rot.—The cure for this great and, by all accounts, increasing evil, Mr. George* proposes to accomplish by a new and ingenious mode of effective ventilation.' By the apparatus described, and the manner of working it by indications of thermometers, an equality of temperature may be maintained in the deepest recesses, as in all other parts, of a ship or house. An equal degree of heat on all sides will pervade the whole fabric, so that this subtle element will never be attracted by colder substances, nor any transmission of it from place to place kept up. For instance, if, as is usually the case, the water in which a ship floats is colder than the confined air of the hold, the cooled planking of the sides will naturally attract the interior heat which will pass through outwards leaving condensed, on the inner surface, the water which it holds in solution. In this case, the thermometer in the hold will indicate the disparity, and the engine man will immediately pump out the warmer air of the hold, to admit a volume of colder air to descend in its place. Now though this would take place without the aid of machinery, the extra-heat of the hold escaping at the scuttles and gangways, yet in closely decked vessels, the process is too slow for the requisite purpose of thorough ventilation. By the machinery recommended, any decked ship may, at any time, be completely ventilated from stem to stern; and the consequences held forth by its adoption, are, durability of the timbers, safety to the cargo, and, what is not less material, highly conducive to the health of the crew.—*Gard. Mag.*

Sugar made from the Water-Melon.—It has been discovered in the state of South Carolina, that a very fine quality of sugar may be extracted from the water-melon, which grows in great perfection there. The landlord of a public-house has shown that all the sugar used in his house during the preceding twelve months, and which had passed as the finest cane, had been obtained from water-melons of his own raising.—*Newsp.*

German Polish.—The wood is prepared with pumice stone rubbed flat, oiled, and then rubbed together till smooth. The only varnish then used is a solution of seed-lac or shell lac in alcohol, the clearest grains of lac being for the lightest varnish. It is coloured red with Brazil wood, and yellow by turmeric root. It is applied with a rubber of five pieces of linen; the varnish is put on with sponge, and having soaked through the linen layers, a little linseed oil is added in the midst of the varnish, and the whole extent of the surface of the article to be polished must be then gone over at once with this rubber. The German cabinet-

* See "Cause of Dry Rot Discovered," 8vo.

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makers polish both the exterior and interior of their works, and finish the inside of drawers, partitions, &c., with great nicety.—*Gill's Repos.*

Dyeing the Hair.—Take common French wine 1 pint; common salt 2 drs.; green copperas 4 drs.; boil for some minutes, and then add oxide of copper 2 drs.; boil for two minutes, take from off the fire, and then add powdered nut-galls 4 drs. Rub the beard and hair with this composition, and some moments afterwards with a warmed linen cloth, and then wash with common water. Another method is oxide of lead, 2 parts; slaked lime 1 part; chalk 2 parts. Mix with water, and dip a brush into the preparation, with which the hair must be well rubbed; after two hours washed. The following is more active: Take quick lime in stone 1lb; yellow litharge and white lead each 1 oz., dissolve the lime in water, and stir in the other articles. These preparations are harmless, but that containing caustic produces erysipelas on the skin.—*From the French.*

Burns and Scalds.—Wheat flour is more beneficial than any other topical application to burns and scalds: it allays inflammation and pain, and effects a cure by hastening incrustation, and by uniting with the discharge.—*Gaz. of Health.*

Crust on Boilers, &c.—Potatoes and flour will prevent the incrustations of boilers and kettles.

Crayons and Pastels.—A valuable paper on the manufacture of these, from the *Dictionnaire Technologique,* will be found in No. 28 of *Gill's Repository.* In the same number will also be found a paper on *Transferring Prints to the surface of wood.* Both these are interesting processes in fine art.

Combs, when stained to imitate tortoiseshell, soon become dull, from the lead used in the dye, putting on its usual metallic appearance. An ingenious German, however, makes similar combs with a beautiful and lasting polish, and Mr. Gill thinks he uses shell-lac spirit varnish for this purpose.

Borax.—A new species has lately been introduced among jewellers, which does not crumble away in being rubbed for soldering.—*See Gill's Repos.* No. 32.

Colouring Prints.—The finest colours for engravings are obtained from flowers: thus, the blue petals of the iris, afford a green fecula, but the finest green is from the ripe berries of the buck-thorn. The berries of dwarf elder afford violet, changed to blue by alum. The gooseberry, cherry, raspberry, madder, and elder, also afford coloured juices. Fustic and logwood decoctions are also used.—*From the French.*

Red Inks.—A beautiful ink may be made of a decoction of cochineal, with a little ammonia added. Carmine in ammonia is, however, the finest, allowing the excess of the alkali to evaporate, and adding a small portion of colourless green arabic.

Solvent for Putty.—The best solvent to take off old putty from glazed sashes, is made thus:—Take American pearl-ash and mix it with slaked stone-burnt lime, to the consistency of paint, and apply the same until you find the strength of the putty is drawn out. The greatest difficulty is to get it to enter the bedding putty, which must be done over with the solvent oftener than any other part. The same solvent will prevent the necessity of burning off paint, as if applied with a brush over the whole surface, it soon destroys the tenacity of the paint.—*Mech. Mag.*

Preservation of Canvass.—An inhabitant of Troyes, in Champagne, has discovered a method of preparing canvass, and every other descrip-

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tion of coarse linen, so as to resist damp, and prevent the approach of insects and vermin, and the inventer promises to make his discovery public.—*Lit. Gaz.*

Cement.—The large snails which are found in gardens and woods, discharge a whitish substance, with a slimy and gelatinous appearance, which has been known to cement two pieces of flint so strongly as to bear dashing on a pavement without the junction being disturbed, although the flint broke into fragments by fresh fractures.—*Mirror.*

Waterproof Composition.—Mr. Henry Hunt, the patentee of the "Waterproof Composition," informs us that for the above invention we are indebted to the scientific researches of Baron Charles Wetterstedz, the brother of one of the ministers of state to the court of Sweden, by whom it was employed to prevent the infection of the plague, by means of absorption through the pores of the soles of boots and shoes; but he accidentally discovered that it rendered them waterproof during a thaw in Sweden, when his boots, being prepared with this composition, resisted the snow-water, and remained perfectly dry, whilst the boots of other persons were saturated, and resembled tripe. Mr. Scott, an experienced engineer, has experimented upon leather prepared with Mr. Hunt's Composition, and found it "impervious to moisture at all degrees of pressure that leather will bear." The best tannage becomes saturated at from ten to fourteen pounds upon the inch, whilst that prepared with the Composition, was not penetrated at 180 pounds upon the inch.

Tanning.—A tanner of Berncastel, on the Moselle, has discovered a new species of tan proper for dressing leather. It is the plant known by the name of bilberry or whortleberry, (Vaccinum Myrtilus or Myrtillis,) which should be gathered in spring, because at this season it dries more readily, and is more easily ground. Three pounds and a half of this tan suffice for dressing a pound of leather, while six pounds are required from the oak to produce the same effect. By this new process tanners can gain four months out of the time required for preparing strong leather. A commission having been appointed at Treves to examine the leather so prepared, reported, that they had never seen any as good, and that every pair of shoes made therefrom lasts two months more than what are manufactured from common leather; that the skin of the neck, which it is difficult to work, becomes strong and elastic like that of the other parts. The shrub should not be pulled up, but cut with a bill, to obtain the reproduction of the plant the following year. When cut, damp does not deteriorate it, which is not the case with oak bark, which loses ten per cent. of its value by being wetted.—*From the French.*

Beet Root Sugar.—There are now in France upwards of one hundred manufactories of beet root sugar, from which were produced last year upwards of 5,000 tons of sugar, worth 60*l.* per ton, or 300,000*l.*; the profit of which is estimated at 15*l.* an acre; but, says one of the manufacturers, the process may be so far improved, that sugar will be made in France from the beet root at 30*l.* per ton, which will increase the profit to 24*l.* an acre. A writer in the *Quarterly Journal of Agriculture* observes that "it is difficult to conceive that one half of the sugar consumed in Great Britain, or in all Europe, will not, in a few years, be home-made beet root sugar."

South Wales Wine.—At the anniversary of the Society of Arts, the Golden Ceres Medal was awarded to Gregory Blaxland, Esq., of Sydney,

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New South Wales, for a sample of wine, the produce of his own vineyard in that colony. Five years ago, the large Silver Medal was conferred on this gentleman, for a sample of wine from the same vineyard. The vines with which it is stocked, are derived from a small, black cluster grape, supposed to be a seedling from one of the claret grapes, originally introduced by Mr. Blaxland. Being a native of that colony, it endures the climate far better than any of the imported vines. The wine sent this year is decidedly better than that for which the former reward of the Society was granted.

The Process of Boring for Water has been practised with great effect in Paris. Two sheets of water have been ascertained to flow beneath the Paris basin; one between the chalk and the green sand, and the other at a greater depth. From the last of these, the water is discharged at St. Ouen to the height of 10 or 12 ft., and the quantity 8,656 gallons daily. The singular fact that wells are affected by the tide is confirmed by observation on those above mentioned.—*London Weekly Review.*

Flax-breaking Machine.—Mr. Ternaux, the celebrated French manufacturer, has obtained a patent for certain machinery for the purpose of depriving flax of its skin, without there being any necessity for resorting to the custom of previously soaking it.—*Le Globe.*

Life Preserver.—Mr. E. Smith, of Liverpool, has proposed a new species of life-preserver. It consists of a collar of cork, 2 in. thick and 19 in. in diameter, with a hole in the middle large enough to let the head pass through. The collar lies upon the shoulders, somewhat like a tippet, and is fastened to the body by strings passing from back to front under the arms: its weight is 2¾ lbs. This collar enables the wearer to lie on his back in the water, and thus to shift his position.

Sealing Wax.—A patent has been obtained by P. R. Wason, Esq., for an improvement in the manufacture of stick sealing-wax. This invention consists in the introduction of a small wick of straw, or any other suitable material, into the stick of wax, which is to be made of equal parts of shell-lac, vermilion, and Venice turpentine, which are to be melted together over a slow fire, formed into pieces, by rolling a portion on a hot copper-plate. A longitudinal notch is then to be made in the stick to receive the wick, which being introduced, the stick of wax is to be rolled into a cylindrical form on the hot plate, or shaped into any other form by being pressed into a mould, and stamped with any required impression. The patentee does not claim the method of manufacturing the sealing-wax, but simply the introduction of the wick, to render it more convenient in application.

Chinese mode of making Vermilion.—Take quicksilver and sulphur, in the proportion of sixteen parts of the former to four of the latter. After powdering the sulphur, place the two ingredients in an earthen jar, the outside of which, to exclude the air, must be plastered with mud and salt, to the thickness of three inches and a half; place an iron cover on the mouth of the jar, and let it be kept constantly moist. Place the jar in an oven early in the morning, and at the same hour on the next morning extinguish the fire; at noon take it out of the oven, and when cold, break the jar in pieces, and take out the contents. Pick out the dross, and then reduce the rest to a fine powder: let this be poured into a large jar full of water. After a time, a thin coating will be found on the surface of the water, which must be skimmed off, and a portion of the water let off; in a short time this process must be repeated, and the third time let all the water be drained off. The sediment is then exposed to dry, and

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afterwards taken out in cakes. This last portion is called "the heart of vermilion."—*Asiatic Journal.*

Polishing Stones.—The Hindoos polish all kinds of stones by means of powdered corundum, mixed with melted lac. The mixture being allowed to cool, is shaped into oblong pieces, of three or four inches in length. The stone is polished by being sprinkled with water, and at the same time rubbed with these oblong masses; and the polish is increased by masses being used successively with finer grain.—*Jameson's Journal.*

Improved Black Dye for Silk Goods.—The *Register of Arts*, part xix., contains a table of experiments, made by the contributor of the report, and Mr. Hemming, the chemist, on specimens of a new and improved dye in the manufacture of black silk. On the authority of the results of these experiments it is affirmed, that a permanent blue black is produced, not only capable of withstanding the action of tea, wine, and all vegetable acids, but of mineral acids also, and of caustic alkalies, when sufficiently diluted to prevent the destruction of the fibres of the silk. The process is also represented to have the effect of considerably increasing the weight, attenuating the thread, and augmenting its bulk: while the texture of the silk is said to be rendered proof against the corrosive action of acids, which act destructively on every species of goods dyed in the ordinary way. The improvement is stated to have been introduced into this country by a young foreigner engaged in executing some work on trial for a dye-house in Spitalfields.

Potash from Potato Tops.—The *Register of Arts* for March details the process, adopted in France, for extracting potash from potato-tops, the upper parts of which contain so considerable a portion as to render the extracting it a very profitable operation. The potato-tops are to be cut off, at four or five inches from the ground, with a very sharp knife, the moment that the flower begins to fall, that being the period of their greatest vigour. Fresh sprouts spring, which not only answers all the purposes of conducting the roots to maturity, but tend to the increase of their size, as the sprouts require less nourishment than the old tops. From the results obtained in France, it is estimated that the quantity of land under annual cultivation with potatoes, in the United Kingdom, which exceeds 500,000 acres, might be made to yield nearly as many tons of potash—an amount nearly fifty times that of our annual importation from America!

To make Gold or Silver Ink.—Take leaves of gold or silver, and reduce them to a fine powder by grinding them with white or refined sugar in a dry state upon a stone with a muller, which very soon tears or reduces them to powder; after this put the paste so formed into a large glass vessel, and mix it with water. The gold or silver, by its weight, falls to the bottom of the vessel, and the sugar dissolves in the water; then decant it, and wash it with more water, until the sugar is entirely removed. Then dry the powder which remains at the bottom, and is exceedingly brilliant. When it is to be used for writing or painting with, grind it up with a solution of gum-arabic, and the ink is made. When dry, polish with a dog's tooth.—*Gill's Repository.*

Lithography.—The *Society of Arts* have awarded to Mr. Joseph Neathercliff a premium of 20*l.* for his improved method of making Lithographic Transfers. His materials are as follow. The *Transfer Paper* is thus made:—Take of tapioca and arrow-root each a quarter of a pound; boil them to paste, and mix them, and with hot water make them into a thin paste, which strain through muslin; then stir into the

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paste a quarter of a pound of flake white, previously well ground in water. The paper, either thick or thin, should be half-sized. Then, with a flat camel's-hair brush, first lay a coat of common parchment size upon the paper, and let it dry in; then lay on the above paste, evenly three times, but letting each coat be well dried between each time of laying it on. As soon as the paper is dry, it should be well cold-pressed, or be sent to the glazing mill, and be flattened between iron rollers, which clears its surface; and the glazed part should be on the back side of the paper, which is effected by rolling two sheets together, face to face. The work, drawn on the prepared face of the paper, is, if fine, to be executed with a steel pen: the dark parts are drawn with a common crow quill.—The *Lithographic Ink* is composed of equal quantities of yellow soap and shell lac, boiled and burnt together in the usual manner, with a sufficient quantity of lamp black added, to make it black; this forms a cake, which is to be rubbed up either with warm or cold water, in the manner of Indian ink. Mr. N. prefers using no tallow or bees' wax in the composition of the ink. Thus the use of the acid is generally avoided, and the lines are not so liable to be injured as is usual. In extreme cases, however, where a mass of shade is condensed, a little acid may be used with good effect. Nitric acid, diluted with water, is the proper requisite. *The Act of Transferring* is easy: Let the stone be moderately warmed; then damp the back of the paper on which the work has been executed, until it lies perfectly flat; take care, however, that no wet touches the work; then lay the paper carefully upon the warm stone, and over it lay flat soft paper, which will absorb the wet on the back of the transfer paper. Now pass it through the press two or three times, with an increased pressure, after which the paper will peel off, leaving the composition it was coated with, as well as the drawing executed upon it, on the stone. Wash off the former, and rub the drawing over with a coat of strong gum arabic water. Lastly, lay it by till it has become cold, and then print from it.—*Trans. Soc. Arts.*

Clay's Paste, of Wheaten Flour and Gelatine.—The paste by which the sheets of whited brown paper were so firmly held together, in the celebrated Clay's, of Birmingham, japanned paper tea-trays, &c., was a composition of wheaten flour and carpenter's glue boiled together. Each sheet of paper was united singly to the others by this paste, the air being carefully driven out from between them by wiping with a coarse cloth from the centre towards the sides; and they were besides carefully dried in stoves, between each layer. Thus combined, they might be sawn, planed, nailed, and glued together, in the manner of wood; but the articles were much lighter and stronger, when japanned, than if formed of wood.—*Gill's Repository.*

Substitute for Fuel.—The following new invention for heating rooms has meet with much encouragement:—A pailful of quicklime dipped in water, and shut hermetically into a box constructed for the purpose, gives out such a heat as to prevent the necessity of fire during the winter.—*Lit. Gaz.*

New Lilac Dyes.—Dr. Macculloch has produced two fine lilac dyes from plants of domestic growth, not hitherto applied to this purpose. One is from the berry of the Portugal laurel, and the other the black currant. The simplest process with alum is all that is required for either; and as far as his trials go, the best tint is produced by the former fruit.—*Mirror.*

The Teasel.—This plant seems to be known in many countries by a

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name expressive of its use. Its old English name was the carding teasel, the Latin name, carduus veneris; the French call it, chardon de foullon; the Danes and Swedes, karde tidsel; the Fleming, karden distel; the Hollanders, kaarden; Italy and Portugal, cardo; the Spaniards, cardencha. The teasel perhaps affords a solitary instance of a natural production being applied to mechanical purposes in the state in which it is produced. The teasel throws up its heads in July and August; these are cut from the plant by hand with a peculiarly formed knife, and then fastened to poles for drying. When dry they are picked and sorted into bundles for sale. Without this useful plant, our woollen manufactory could hardly have made any progress; it appears, from many attempts, that the object designed to be effected by the teasel cannot be supplied by any contrivance—successive inventions having been abandoned as defective or injurious. The use of the teasel is to draw out the ends of the wool from the manufactured cloth, so as to bring a regular pile or nap upon the surface, free from twistings and knottings, and to comb off the coarse and loose parts of the wool. The head of the true teasel is composed of incorporated flowers, each separated by a long, rigid, chaffy substance, the terminating point of which is furnished with a fine hook. Many of these heads are fixed in a frame; and with this the surface of the cloth is teased, or brushed, until all the ends are drawn out, the loose parts combed off, and the cloth ceases to yield impediments to the free passage of the wheel or frame of teasels. Should the hook of the chaff, when in use, become fixed in a knot, or find sufficient resistance, it breaks, without injuring or contending with the cloth; and care is taken by successive applications to draw the impediment out; but all mechanical inventions hitherto made use of offer resistance to the knot, and, instead of yielding and breaking, as the teasel does, resist and tear it out, making a hole, or injuring the surface. The dressing of a piece of cloth consumes a great multitude of teasels—it requiring from 1,500 to 2,000 heads to accomplish the work properly. They are used repeatedly in the different stages of the process; but a piece of fine cloth generally breaks this number before it is finished, or we may say that there is a consumption answering to the proposed fineness—pieces of the best kinds requiring 150 or 200 runnings up, according to circumstances.—*Journal of a Naturalist.*

Cheap Wine.—The following is stated to be a chemical analysis of a bottle of a cheap commodity, sold under the denomination of port wine: Spirits of wine, 3 ounces; cider, 14 ounces; sugar, 1½ ounce; alum, 2 scruples; tartaric acid, 1 scruple; strong decoction of log-wood, 4 ounces.—*Mech. Mag.*

Bacon.—Elder leaves bruised in a mortar, with a little water, will destroy skippers in bacon, without injuring the meat.—*Amer. Journ.*

Ale brewers usually put into the bung-hole of each cask, when stowed away, a handful of half-boiled hops impregnated with wort, the object of which is to exclude the atmospheric air by covering the surface of the liquid; but some brewers, more rigidly attentive, insert (privately) at the same time, about one ounce of powdered black rosin, previously mixed with beer, which swims on the surface, but after a time is partially absorbed.—*Lib. Useful Know.*

Laurel.—The butchers of Geneva prevent flies from attacking the meat in their shops, by rubbing the walls and boards upon which the meat is placed with the essential oil of laurel.—*Lit. Gaz.*

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EXPEDITIONS OF DISCOVERY.*

Establishment of the New Colony on the Swan River, on the western coast of New Holland.—Captain Stirling, R. N. explored last year, in the ship the Success, the western coasts of New Holland, from Cape Lewin to the south-west extremity. From his report, founded on an examination of 500 miles of the coast, government determined to form a new establishment upon Swan River, in a spot situated at 32° 40′ S. lat. This river, which derived its name from the great number of black swans which were found in it, had already been visited, for 60 miles into the interior, by Capt. Freycinet's expedition. Capt. Stirling explored the river to its source, and the surrounding country, which is, according to his report, very picturesque and fertile. Capt. Stirling's first interview with the natives, whom he met in ascending the river, had an hostile character, but they soon established the best understanding, which was not afterwards troubled. These natives were quite savage, carrying no other clothing than the skin of the kangaroo or the opossum: they are armed with lances pointed by bones or stone. Their only utensils were hatchets of stone, hooks made with scales, and fishinglines made with the bark of trees. During the summer months, they come in great numbers upon the coasts, feeding upon fish, which they kill with their lances. They have no nets, and do not even know how to construct a boat or a raft.

The climate of Swan River appears to be very healthy. The heat, which is great towards the middle of the day, is tempered by frequent rains and breezes that come from the mountains: the mornings and evenings offer sufficient time for labour, and the nights are fine and serene. It is probable that the heat is more intense on the shores of the sea than in the interior; nevertheless, not one of Capt. Stirling's crew suffered the least inconvenience from it. The soil appears particularly well adapted to agriculture; springs issue from all points; vegetation is very vigorous; ferns and thistles attain a height of twelve feet. The principal birds of the country are the emu or cassowary, the swan, several species of ducks, quails, pigeons, parrots, falcons, and several singing birds. Seals, sharks, and whales, are frequently seen on the coast. Fish are very abundant, and of the best quality.

Capt. Stirling has been named governor of the new establishment. Lieut. Rose, who accompanied Capt. King in his expedition to New Holland, will fill the office of general inspector of the colony, and many gentlemen have joined the expedition with very large grants of land. At a meeting of the Linnæan Society, (May 5. 1829,) part of a paper,

* These interesting particulars have been abridged (unless otherwise denoted,) from the *Edinburgh Journal of Natural and Geographical Science*, commenced in the autumn of last year, and published monthly. This is, we believe, the first *Geographical* Journal published in England; and may be considered a very valuable acquisition to our Scientific Literature.

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entitled, "Remarks on the Botany and Geology of the banks of Swan River, Isle of Buache, Geographe Bay, and Cape Naturaliste; by Mr. Fraser, colonial botanist, of Sidney, in New Holland," was read, and excited considerable interest. Mr. Fraser, accompanied Captain Stirling during his survey of that part of New Holland. As the remarks of a scientific man must always be of the greatest use, we shall give them here in his own words:

"In giving my opinion of the land seen on the banks of the Swan River, I hesitate not in pronouncing it superior to any I ever saw in New South Wales, east of the Blue Mountains, not only in its local character, but in the many existing advantages which it holds out to settlers. These advantages I consider to be—

"*First*, The evident superiority of soil.

"*Secondly*, The facility with which a settler can bring the farm into a state of immediate culture, resting upon the open state of the country—a state which allows not of a greater average than ten trees to an acre.

"*Thirdly*, The general abundance of springs, producing water of the best quality, and the consequent permanent humidity of the soil—two advantages not existing on the eastern coast.

"*Fourthly*, The advantages of water coming to the door, and the non-existence of any impediment to land carriage."*

Professor Hanstein.—Letters have been received from this enterprising traveller and his companions. They left Tobolsk Sept. 12th, 1828, and travelled on sledges, the cold being at 40 deg. of Reaumur, so that frozen quicksilver could be cut with a knife. On Feb. 7, they reached Irkutzk, about 4,000 versts from Tobolsk. They afterwards visited Kiachta, and crossed the frontier of China; but the most agreeable result is, that one of the desired objects of the journey is accomplished, as the observations have proved very satisfactory, and the position of a new magnetic pole is ascertained. Two very singular discoveries have been made:—1st, That the whole of Siberia, from the European frontier to Uchotsk, is intersected by good roads; 2ndly, a probability that the northern descent of the Oural may contain gold and platina, as lately discovered on the western and southern declivity of the same mountain ridge.

Timbuctoo.—The publication of M. Caillé's voyage will take place simultaneously with the present work. It appears that Caillé reached Timbuctoo very shortly after the death of Major Laing; and further, by a document and letters, "that the Major was sent out of the town under the care of a Sheik of the Arabs of the Desert, who, on arriving at his own place of residence, killed him in the most cowardly manner."—Another expedition into the interior of Africa is projected.

Egypt.—Several interesting letters from M. Champollion have appeared in French Journals, whence they have been translated into our *Literary Gazette.*

The Morea.—Colonel Bory St. Vincent and his companions have performed a scientific journey into the Morea, which promises the most interesting results.

* During the year a variety of valuable information has been published respecting this new settlement. A popular description of the colony, with the government regulations for settlers, will be found in Nos. 368 and 369 of *The Mirror*, with an outline chart; and No. 410 contains an Engraved View on the River, and the whole of Capt. Fraser's Report, above alluded to. Some useful "Hints" have likewise been published by Mr. Cross, 18, Holborn; and a paper, probably, in part, from an official source, has appeared in No. 78 of the *Quarterly Review*.

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Dr. Parrot has set out from Dorpat, to explore the country around *Mount Ararat*.

Russian Voyages in the Oural and the Altai.—In this excursion, which has been made to the very borders of China, there have been collected 1,600 dry and 241 living plants, 1,341 grains, 700 animals, minerals, and antiquities.

A new Voyage round the World.—A new scientific expedition has been planned at Toulon. After having touched at Teneriffe and the Cape de Verd Islands, the expedition will go to Rio Janeiro; thence to Chili; will double Cape Horn, and go to explore the coast of California. The Ladrone Islands, New Holland, New Guinea, and some parts of the coast of China, will be visited in succession; and the expedition will return by the Straits of Sunda, Isle of France, and the Cape of Good Hope.

Pacific Ocean.—The Government of the United States has sent off three ships to explore the Pacific, and the numerous islands and reefs of that vast sea, whose positions are not well determined, so as to give them a fixed place upon the map.

Straits of Magellan.—A letter from a British discovery ship, near Cape Horn, mentions the discovery of a channel through Terra del Fuego, commencing at Magdalen's Sound, and coming out west of Cape Noir; but it has many communications with the sea between that Cape and Christmas Sound.

Western Coast of Africa.—Accounts have been received from Capt. Boteler, which afford another sad proof of the insalubrity of the African climate. At Sierra Leone, many of his companions fell victims to fever; and an English merchant ship was found with the whole of her crew lying dead on board!—*Lit. Gaz.*

West Indies.—His Majesty's ship *Blossom*, commanded by Captain Richard Owen, has been directed to complete the survey of the different parts of the West Indies, which have been left undone by the Spaniards and M. de Meyne; and to ascertain correctly the meridian distances between the principal points in the West Indies chronometrically.

M. Rifaud's Travels, which have occupied 22 years, out of which 13 have been passed in Egypt, have excited much interest in France. He has made upwards of 6,000 drawings; his notes fill 14 volumes; and his specimens and collections are very extensive.

New Guinea.—An European colony has been established on the coast of New Guinea, at the instance of the King of the Low Countries.

South Pole.—Letters, dated off the Cape of Good Hope have been received from Captain Forster, who has procured satisfactory observations at Cape Horn and South Shetland; and from his observations, consisting chiefly of pendulum experiments, important results may be expected.

Captain Ross—Accounts from Orkney state that Captain Ross, in the *Victory* steamer, had touched at Icelanburgh, on his northward course; and that, with "all well," he had found the season unusually open—*(November Journal.)*

Russian Voyage of Discovery.—The vessels *Moller* and *Simavin* have returned, after a three years voyage round the world. Among their results, are a survey between Kamtskatka and Behring's Straits, and the discovery of several new groupes in the Archipelago of the Carolines.

An account of Baron Humboldt's visit to the Ouralian Mines has been read in the French Academy of Sciences. On the Asiatic declivity gold and platina are often found a foot below the surface; and the annual produce is 6,000 kilog. of gold. He crossed Chinese Tartary, and

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visited rich mines of beryls and topazes; and a silver mine, which produces annually above 40,000 pounds of auriferous silver.

The Caucasus.—On June the 26th an expedition left Tiflis, for the mountain Elborouss, with an escort of 600 Russians, and 350 Cossacks. They did not reach the summit (16,800 feet beyond the level of the Atlantic); but this was accomplished by an adventurer, who received a reward of 400 roubles and five archives of cloth from the general of the cavalry. Two of the expedition reached 15,200 feet; and one of them stated that the experiments on the decrease of magnetic intensity corresponded with those made by Gay Lussac, in a balloon.

The Antarctic Pole.—An American brig is to sail from New York on a voyage of discovery, which is to last three years, to explore the ice-clad regions of the Antarctic Pole.—*Lit. Gaz.*

Thibet.—Dr. Gerard has lately visited the valley of Sulej, the highest inhabited spot on the globe. One of the villages where he stopped is 14,709 feet above the level of the sea: by artificial means and solar heat, rye was raised in fields 14,900 feet; and Dr. Gerard thinks that cultivation may be carried to 16,000 or 17,000 feet. To the north of the frontier of Konnaour, Dr. G. reached more than 20,000 feet, without crossing the perpetual snow. At one in the afternoon the thermometer was at 2° 78m centigrade below Zero. In his journey Dr. G. met with a learned traveller, from whom he ascertained that lithography had been practised in Thibet from time immemorial.

La Perouse.—M. Derville, who commanded the *Astrolabe*, in the late voyage undertaken to search for traces of the expedition of La Perouse, considers the island, the summit of which was observed fifteen leagues to windward, by the frigates *La Récherche* and *L'Esperance*, which composed the expedition of Admiral D'Entrecasteaux, in 1793, and to which the name of the Isle de la Récherche was then given, to be the identical island, Vanikoro (or Vanicolo) on the shores of which the remnants of La Perouse's vessel have been found. The geographical position of latitude and longitude of the Isle of Vanikoro agrees exactly with that of the island to which the name of Récherche was given by D'Entrecasteaux. That island was then confounded with the number of other islands which had been seen by the expedition, and which it had been found impossible to examine in detail.—*Athenæum.* The narrative of the voyage, by Chevalier Captain P. Dillon, has been published in Paris and London.

The Niger.—Sir Rufane Donkin's new hypothesis respecting the Nile briefly stands thus:—The Niger (Ni-Geir) passes through Wangara, and emptying itself into the Wad-El Ghazeh, or Nile of Bornou, which is formed by the continuation of the Misselad (Geir) through Lake Fittre, flows under the Sands of Bilmah into the Mediterranean Sea. Sir Rufane is likewise of opinion—that "reasoning from analogy, and still more from what we know of the nature of the country, I have no doubt but that in very remote ages, the united Niger and Geir did roll into the sea in all the magnificence of a mighty stream, forming a grand estuary or harbour where now the quicksand is."—"The question to be solved under such a supposition is, what revolution in nature can have produced so great a change in the face of the country, as to cause a great river, which once flowed into the sea, to stop short in a desert of sand."—Sir Rufane then instances the sand of the desert west of Egypt, encroaching on, and narrowing the valley of, the Nile, and infers that a mighty sand-flood has produced these desolating changes.

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MISCELLANIES.

LIST OF PATENTS.

Anchors—Improvements in the construction of, W. Roger, Norfolk-street, Strand.

Apparatus—An improved piece of machinery applicable to steam-engines, pumps, water-wheels, &c., Mr. S. Smith, Derby.

Apparel—Preparation of a new kind of cloth, and the application thereof in the making of stays and other articles of dress, Mr. James Sinister, Birmingham.

Axletrees—Improvements in axletrees and boxes for carriage-wheels, Mr. J. Slater, Birmingham.—An improvement in axletrees for, and mode of applying them to, carriages, Margaret Knowles, Lavender-hill, Battersea.—Improvements on axles or axletrees, and coach and other springs, G. K. Sculthorpe, Robert-street, Chelsea.

Bankers' Checks—Improvements in the manufacture of blank forms for bankers' checks, &c., to prevent forgery, N. Jocelyn, Newhaven, Connecticut, United States.

Baths—Improvements in, Mr. W. Gooch, Mount-street, Berkeley-sq.

Barilla—Improvements in preparing, J. Mc Leod, Esq., Westminster.

Bits—Improvements in, Mr. Valentine Llanos, Hampstead.

Bleachers' Retorts—Improvements in retorts used by bleachers and makers of oxymuriate of lime, Mr. J. Morfitt, Corkridge, near Leeds.

Brickmaking Machinery—Mr. J. Cowderoy, Britannia-street, City-road.

Building—An improved method of constructing and forming ceilings and partitions for dwelling-houses, warehouses, &c., in order to render the same more secure against fire, Mr. W. North, Guildford-place, Kennington.

Burning Smoke—New method of, Mr. John Forbes, Cheltenham.

Calico Printing—An improved method of making metallic cylinders for, Mr. B. Cook, Birmingham.

Cane Juice—Improvements in the concentrating and Evaporating of cane juice, Mr. J. Atchison, Clyde-buildings, Glasgow.

Cannon—Certain improvements in the construction of, Mr. J. Tucker, Hammersmith.

Carriage-drags—An improved drag, applicable to wheel-carriages, to stop or retard their motion, Lieutenant R. Parker, R. N., Hackney.

Carriages—An apparatus to afford safety in travelling, Mr. Z. Riley, Union-street, Southwark.—Improvements in the wheels and axletrees of, Mr. E. Josephs, Haydon-square.

Cartridges—Improvements in making, Mr. J. D. Whitehead, Saddleworth, Yorkshire.

Cat-head Stoppers—Improvements in the construction of, Mr. W. Rodger, Norfolk-street, Strand.

Chandeliers—Glass and metal, improvements in, Mr. T. Osler, Birmingham.

Cloth—Improvements in machinery applicable to dressing woollen cloths, Mr. J. C. Daniell, Limpley Stoke, Wilts.

Coaches—An improved coach, Mr. T. Brown, Birmingham.

Condensing Gas—Improvements in condensing gases produced by the decomposition of muriate of soda, Mr. J. Wright, Newcastle-upon-Tyne.

Cordage—Improvements in the manufacture of, Mr. John Robertson, Limehouse Hole, Poplar.

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Cotton—Improvements in apparatus for removing the down from cotton and other fabrics, by singeing, Mr. P. Descroizilles, Fenchurch-street.

Cocoa—Improved preparation of, Mr. Marshall, Southampton-street, Strand.

Culinary Apparatus—An improved arrangement of flues for the communication of heated air to culinary vessels, Mr. J. Frazer, Limehouse.

Distillation—Improvements in, Robert Stein, Regent-street. Improved distilling and rectifying apparatus, Mr. E. D. Phillips, Regent-street. —Improvements in, Mr. W. Shand, of the Burn, Kincardineshire.

Dressing Stones—A machine or engine for, Mr. J. Milne, Edinburgh.

Embroidery—Improvements in machinery for embroidering and ornamenting cloth, Mr. H. Bock, Ludgate-hill.

Evaporation—Improvements in evaporating sugar and other substances, W. G. Kneller, Great Pearl-street. A new mode of converting liquids into vapour, Messrs. J. Braithwaite and J. Ericson, New Road, Middlesex.

Fire-arms—Certain improvements in apparatus to be applied to fowling-pieces and other fire-arms, Messrs. Lawrence, Strood, and J. Crundwell, Ashford.

Fire-places—Certain improvements on or additions to, J. A. Fonzi, Esq., Upper Marylebone-street.

Furniture—Improvements in chairs, sofas, &c., Mr. T. Minikew, Berwick-street.

Garden Syringes—Improvements in, Mr. D. Macdougal, Edinburgh.

Gas Lamp—A new or improved gas lamp or burner, T. Kilby, Wakefield, and H. F. Bacon, Leeds.

Gilding Woven Fabrics——Methods of gilding and silvering woven fabrics, to be used instead of gold and silver laced borderings, Mr. J. Burgis, Maiden-lane, Covent Garden.

Harness—Improvements or additions to harness or saddlery, part or parts of which improvements or additions are applicable to other purposes, Mr. W. Leeson, Birmingham.

——— *and Saddles*—Improvements in, Mr. W. Taft, Birmingham.

Hats and Bonnets—An improved imitation of Leghorn hats and bonnets, Mr. A. Deninos, Leman-street, Goodman's-field.

——— *Caps*—A combination of machinery for manufacturing, Mr. T. W. C. Moore, Hampstead.

Heat—An improvement in apparatus for communicating heat, Messrs. H. C. Price and C. F. Price, Bristol.

"*Human Snare*"—A machine for detecting and detaining depredators and trespassers, so denominated, Mr. Madeley, Yardley, Worcester.

Illumination—Improvements in the mode of producing artificial light, Mr. W. Heard, Devonshire-street, Vauxhall-road.

Improved Vehicle—A new or improved vehicle for the carriage of passengers or goods, Mr. L. Quetin, Great Winchester-street.

Instantaneous Light—An improved method of procuring, Mr. S. Jones, Strand.

Instruments—Improved apparatus for sharpening, Mr. F. Westby, Leicester.

Iron—Improvements in smelting and other processes in making bar-iron, Mr. J. Lambert, Liverpool-street.

—— *Plate*—A new method of manufacturing or preparing, Mr. T. Morgan, Tipton.

Knives—For improvements in sharpening knives and other edge tools, W. Church, Esq., Heywood House, Birmingham.

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Lace—An improvement in the manufacture of bobbin-net lace, Mr. T. Lawes, Strand.—Improvements in machinery for making bobbin lace net, Mr. J. Levers, Nottingham.—Improvements in machinery for making, Mr. T. Bailey, Leicester.

Lever—Improvements in the lever, and the application of its power, Mr. J. Nicholls, Pershall.

Light—A new preparation or manufacture of a certain material produced from a vegetable substance, and the application thereof to the purposes of supplying light, Mr. J. Soames, jun., Wheeler-street, Spitalfields.

Locks—An improvement in the construction of locks for fire-arms, Mr. G. H. Manton, Dover-street.

Machinery—A new method or methods of applying animal power to, Mr. T. S. Brandreth, Liverpool.

Malt-Kiln—An improved, Mr. T. Salmon, Stokeferry, Norfolk.

Masts—Improvements in the construction of made masts, Mr. R. Green, Blackwall.

Machinery—For cutting, marble, wood, &c., Mr. J. Gibbs, Crayford, Kent.

Mechanical Power—Applicable to different machinery, Mr. T. I. Fuller, Commercial-road, Limehouse.

Mills and Mill-stones—Improvements in, Mr. John M'Curdy, Great James-street, Bedford-row.

Medicine—Embrocation to prevent or alleviate sea-sickness, Mr. P. Derbyshire, Ely Place, Holborn.

——— A certain medicine for gouty affections of the stomach, spasms, &c. Mr. J. Mushet, York Square, Regent's Park.

Motive Power.—Improvements in the application of elastic and dense fluids to the propelling of machinery, Mr. R. Williams, Tabernacle Walk.

Music Books.—A mechanical *volti subito* to assist musicians in turning over quickly the leaves of music-books whilst playing, Mr. A. Lewis, Birmingham.

New Movement—Method of converting a rotary into a reciprocating action, Messrs. W. Parr, Union Place, City Road, and J. Bluett, Blackwall.

Paper—Certain improvements in the manufacture of paper for the hangings of rooms, &c. T. Cobb, Esq., Calthorp House, Oxford

——— *Making*—Improvements in the manufacturing and cutting of paper, Mr. J. Dickenson, Abbott's Langley, Herts.

Piano-Forte—Improvements upon the self-acting, Mr. T. H. Rolfe, Cheapside.

Piano-fortes—Improvements in, Mr. J. Stewart, George-street, Euston-square.

Power and Motion—Certain apparatus for the purpose of communiting, Mr. R. Torrens, Croydon.

——— *Engine*—An engine to be worked by fluids or gases, P. Pickering, Dantzic, and W. Pickering, Liverpool.

——— *Loom*—Improvements for power-looms in weaving cloth, Mr. W. Ramsbottom, Manchester.

Projectiles—An improved projectile, Mr. I. Dickson, Chester Street, Grosvenor Place.

Propelling—Improvements in propelling vessels, M. C. Cummerow, Laurence Pountney Lane.

——— Improvements in propelling vessels, Mr. J. Dutton, jun., Wooton-under-Edge.

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Propelling—Improvements in machinery for propelling steam-vessels, Mr. J. Perkins, Fleet Street.

———— A machine or apparatus for propelling carriages, vessels, and locomotive bodies, Mr. R. Crabtree, Halesworth.

———— *Machinery*—New and improved machinery for propelling carriages, or ships and other floating bodies, Mr. J. Moor, of Broad Wier, Bristol.

———— ————Improvements in machinery for propelling vessels, &c. W. Church, Esq. of Heywood House, Birmingham.

———— *Vessels*—Improved paddle-wheels for, W. Stead, Gildersom, and J. Stead, Doncaster, Yorkshire.

———— Improvements in the wheels or apparatus for, Mr. A. Bernhard, Finsbury Circus.

Raising Fluids—Improvements in raising fluids to various distances, Mr. E. Wicks, King's Road, Chelsea.

Rigging—Improvements in the machinery for securing, supporting, and striking top-masts, Mr. Prior, Albany Road, Camberwell.

Ropes, Cordage, &c.—Improvements in the manufacture of, Mr. G. Harris, R.N., Brompton Crescent.

Rudders—An improved mode for constructing the pintles for hanging rudders, Capt. John Lihou, Guernsey.

Sashes, Shutters, Doors, &c.—Improvements in, designed to afford security against burglars, Messrs. W. H. Kitchen, St. Giles's, and A. Smith, York Terrace, Westminster.

Self-acting Air or Gas Regulator—or Stop-cock, applicable also to other purpose, Mr. George Daure, Birmingham.

Ships' Windlasses—An improvement in, Mr. G. Straker, South Shields.

Ships' Scuppers—Improvements in, Mr. J. W. Dodgson, Lower Shadwell.

Shot, exploding, or Projectile—Mr. John Tucker, Hammersmith.

Shears—For cropping woollen cloth, improved, Mr. W. Clutterbuck, Oxlebrook, near Stroud, Gloucester.

Silk—Improved manufacture and application of, Mr. F. Nash, Stoneason, near Wells.

Specific Gravity—Apparatus to ascertain and register the specific gravity and temperature of fluids in transit, Mr. W. Brunton, Lombard Street

Spinning—Improvements in the machinery for spinning cotton and other fibrous substances, Mr. G. W. Lee, Bagnio Court, Newgate Street. —Improvements in the machinery for spinning cotton, Mr. J. Hutchinson, Liverpool.

Steam-boilers, Carriages, &c.—Mr. James Viney, Piccadilly.

Steam—Improvements in the apparatus for raising or generating steam and currents of air, and for the application thereof to locomotive engines, and other purposes, Mr. M. Poole, Lincoln's Inn.

——— *Boilers*—Improved method of constructing, Mr. J. Bates, Bishopsgate Street.

——— *Engines*—Improvements in, Mr. T. Banks, of Patricroft, Lancashire. Improvements in, Mr. J. D'Arcy, Leicester-square.—Improvements in rotary, Mr. G. Rennoldson, South Shields.—Improvements in the, Mr. J. Udney, Arbour Terrace, Commercial Road. —Improvements in steam-engines, and in machinery for propelling vessels, Mr. E. Galloway, King Street, Southwark.

——— *Machinery*—Improvements in, for propelling vessels, Mr. J. Pumphrey, Tally Hill, Worcester.

——— *Navigation*—Improvements in paddles and machinery, Mr. O. H. Williams, North Nibley, Gloucestershire.—An improved construc-

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tion of paddles, Mr. S. Gritton, Pentonville.—Machinery for propelling vessels, Mr. F. Neale Gloucester.—Improvements in paddles, Mr. A. Robertson, Liverpool.—Improvements upon paddle wheels, Mr. W. E. Cockrane, Regent Street.

Steel—New method of making, C. Sanderson, Park Gate Iron Works, Rotherham.

Stop Cocks—An improved cock or tap for drawing off liquids, Mr. J. M. Ross, Symonds Inn.

Street Ways — An improved process of constructing street-ways, Messrs. J. Rowland and C. M'Millars, Heneage Street, Brook Lane, Spitalfields.

Sugar Refining—Improved method of expelling the molasses from sugar, Mr. J. Hague, Cable Street, Wellclose Square.—Improvements in the condensing apparatus used for boiling sugar in vacuo, Mr. J. Davis, Leman Street.

Surveying—improvements on machines or apparatus for measuring land, and other purposes, Mr. J. Chesterman, Sheffield.

Sugar and Farina—From vegetable productions, improved manufacture of, Mr. B. Goulson, near Manchester.

——— *Syrup*—Extracting from cane juice and refining, Mr. C. Derosne, Leicester-square.

Sweeping Machines—Improved machines for sweeping, scraping, and watering roads, &c., John Boase, Albany Street, and Thomas Smith, Augustus Street, Regent's Park.

Table Forks—Improvements in, Messrs. G. Rodgers, J. C. Hobson, and J. Brownill, Sheffield.

Tiles—Improvements in tiles for houses and other buildings, F. H. N. Drake, Esq., of Colyton House, Devon.

" *Till*"—For " being in possession of the process for the invention of a peculiar till," Francis Horatio Nelson Drake, Esq., Colyton House, Devon.

Time Keepers—Certain improvements in watches and time-keepers, Mr. T. Westwood, Princes Street, Leicester Square.

Vegetable Substance—New preparation from, to afford light, and other uses, Mr. James Soames, jun., Wheeler-street, Spitalfields.

Warehouses—Improvements in the construction of warehouses, and similar buildings, H. R. Palmer, Esq., London Docks.

Washing, Dyeing, and Calendering—Improved machinery to facilitate various operations connected with, Mr. J. Rayner, King Square.

Water Closets—Improvements in the construction of, Mr. H. Tyler, Warwick Lane.

Watches—Certain improvements applicable to, Mr. I. Brown, Gloucester Street, Clerkenwell.

Whitening Sugars—A new process of, Mr. J. Bates, Bishopsgate Str. Within.

Windmills—Improvements in the construction of, Mr. J. C. Hewes, Manchester.

Woollen Cloth—Improved machinery for raising and finishing, Messrs. J. and J. Charlesworth, and S. A. Mellor, Holmfirth.—Improvements in machinery for dressing, Mr. J. Jones, Leeds.—An apparatus applicable to dressing woollen cloth, Mr. S. Walker, Buston, Leeds.

Woollen Cloth—Improvements in dressing, Mr. T. Gether, Furnival's Inn.

Working Horn—Methods of making various articles from horn and hoofs of animals, Messrs. J. and T. Deakin, Sheffield.

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CALENDAR OF THE MEETINGS OF THE SCIENTIFIC BODIES OF LONDON FOR 1829-30.

Societies.	Time of Meeting.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.
Royal .... *Somerset-House.*	Thu. 8½ P.M.	19, 26, 30*	10, 17, 24	14, 21, 28	4,11,18,25	4, 11, 18, 25	1, 22, 29	6, 13, 20, 27	10, 17
Antiquaries .... *Somerset-House.*	Thu. 8 P.M	19, 26	3, 10, 17, 24	14, 21, 28	4,11,18,25	4, 11, 18, 25	1, 23*, 29	6, 13, 20, 27	10, 17
Linnean .... *Soho-Square.*	Tues. 8 P.M.	3, 17	1, 15	19	2, 16	2, 16	6, 20	4, 24*	1, 15
Zoological Club.. *Soho-Square.*	Tues. 8 P.M.	9, 23, 29*	14	12, 26	9, 23	9, 23	13, 27	11, 25	8, 22 July 13, 27
Horticultural..... *Regent-Street.*	Tues. 1 P.M.	3, 17	1, 15	5, 19	2, 16	2, 16	6, 20	1*, 4, 18	1, 15
Medico-Botanical *Sackville-Street.*	Tues. 8 P.M.	10	8	Sat. 16*	9	9	..	11	8 July 13
Society of Arts .. *Adelphi.*	Wed. 7½ P.M.	4, 11, 18, 25	2, 9, 16, 23	13, 20, 27	3,10,17,24	3, 10, 17, 24, 31	7,14,21,28	5, 12, 19, 26	2, 9
Royal Society of Literature .. *Parliament-St.*	Wed. 3 P.M.	4, 18	2, 16	6, 20	3, 17	3, 17	7,21,29*	5, 19	2, 16
Zoological Society *Bruton-Street.*	Thu. 1 P.M.	5	3	7	4	4	1, 29*	6	3
Geological ...... *Somerset-House.*	Fri. 8½ P.M.	6, 20	4, 18	1, 15	5, 19*	5, 19	2, 16	7, 21	4, 18
Astronomical .... *Lincoln's-inn Fds.*	Fri. 8 P.M.	13	11	8	12*	12	Wed. 7	14	11
Royal Institution *Albemarle-Str.*	Fri. 8½ P.M.	.	..	22, 29	5,12,19,26	5, 12, 19, 26	2, 23, 30	1*,7,14,21,28	4, 11
Royal Asiatic.... *Grafton-Street.*	Sat. 2 P.M.	..	5, 19	2, 16	6, 20	6, 20	3, 17	1, 15	7*, 19 July 3, 17

* ANNIVERSARIES.—Zoological Club, Nov. 29.—Royal Society, Nov. 30, 11 A.M.—Medico-Botanical, Jan. 16, 2 P.M.—Astronomical, Feb. 12, 3 P.M.—Geological, Feb. 19, 1 P.M.—Antiquaries, April 23, 2 P.M.—Royal Society of Literature, April 29.—Zoological Society, April 29, 1 P.M.—Royal Institution, May 1.—Horticultural Society, May 1.—Linnean, May 24, 1 P.M.—Asiatic, June 7 [illegible]

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American General Atlas.—Arnott's Elements of Physics, vol. 2, part 1.—Bakewell's Introduction to Mineralogy.—Bee (The) Preserver.—Bell's Gothic Architecture of Ireland.—Bloxam's Principles of Gothic Architecture. — Brande's Outlines of Geology. — Caledonian Horticultural Transactions, vol. 4, part 2.—Cambridge Philosophical Transactions, vol. 3, part 1.—Castle's Introduction to Botany.—Chapters on the Physical Sciences.—Congreve's Treatise on the Rocket System.—Conversations on Vegetable Physiology, 2 vol.—Cressy and Taylor's Architecture of Italy.—Dell's Evening Amusements.—Dillon's Discovery of the Fate of La Perouse, 2 vol.—Donkin's Dissertation on the River Niger.—Encyclopædia Londinensis, 24 vol. (complete.)—Exley's Principles of Natural Philosophy.—Fincham's Treatise on Ship-building. —Fincham's Treatise on Masts, Ships of War, and Yachts.—Flaxman's Lectures on Sculpture.—Graham's Chemical Catechism.—Grainger's Elements of Anatomy. — Gwilt's Anglo-Saxon Grammar. — Hawkins' Elements of Medical Statistics.—Hay's System of Mechanics.—Holland's Inquiry into Animal Life.—Home's Principia Medicinæ.—Home's Comparative Anatomy, vols. 5 and 6.—Hooker's Flora Boreali-Americana, part 1.—Horsfield's Lepidopterous Insects, part 2.—Horsfield's Zoological Researches in Java.—Humboldt's Personal Narrative of Travels, vol. 7.—Hunt's Exemplars of Tudor Architecture.—Journal of a Naturalist.—Kendrick's Conversations on the Art of Miniature Painting.—Lardner's Lectures on the Steam-Engine.—Loudon's Encyclopædia of Plants.—M'Intosh's Practical Gardener, 2 vol.—Murray on Atmospheric Electricity. — Murray's Experimental Researches on the Glow-worm. — Pomological Magazine, vol. 2.—Price on the Physiognomy of the Inhabitants of Great Britain. — Pugin and Le Keux's Antiquities of Normandy.—Pugin's Public Buildings of London, by Britton, 2 vol.—Randall's Description of the Bones of the Skeleton.—Reid's Elements of Chemistry.—Richardson's Zoology of Northern British America.—Robinson's Designs for Ornamental Villas.—Scripture Geology, or Geological Phenomena, 2 vol.—Transactions of the Cornwall Geological Society, part 1.—Transactions of the Royal Society of Literature, vol. 1, part 2.—Transactions of the Medico-Chirurgical Society, vol. 15, part 1.—Ure's New System of Geology.—Vanherman's Painter and Colourman. — Vegetable Cookery. — Wallich's Plantæ Asiaticæ Rariores. — Walsh's Notices of Ancient Coins and Medals.—Wood's Antiquities of Balbec and Palmyra.

OBITUARY OF EMINENT PERSONS IN SCIENCE AND ART.

Within the short period of six months of the past year, the scientific world lost three of its most distinguished members;

Dr. W. H. Wollaston, late Vice President of the Royal Society.—Dr. Thomas Young.—Sir Humphry Davy, Bart., late President of the Royal Society.

Dr. John Curtis, a distinguished Naturalist. — Dr. E. Goodwyn, author of a valuable work "On Submersion."—Rev. J. Carter, author of several antiquarian papers in the "Transactions of the Royal Society."—Mr. T. Haynes, author of several works on Horticulture.—William Stevenson, Esq.—Dr. Hamilton, Professor of Mathematics in Marischal College, Aberdeen; which chair he had filled for 50 years.—Mr. J. Kendall, Statuary, of Exeter.—T. Mawe, Esq. a popular writer on mineralogy, &c.—J. Spode, Esq., author of many useful improvements in pottery, &c.—William Wadd, Esq., an ingenious writer on medical science.

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INDEX.

MECHANICAL INVENTIONS.

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CHEMICAL SCIENCE.

Digitized by Google

NATURAL HISTORY.

Digitized by Google

ASTRONOMICAL AND METEOROLOGICAL.

Digitized by Google

AGRICULTURE AND RURAL ECONOMY.

GARDENING.

DOMESTIC ECONOMY.

Digitized by Google

USEFUL AND ORNAMENTAL ARTS.

EXPEDITIONS OF DISCOVERY.

MISCELLANIES.

Digitized by Google

Digitized by Google

Digitized by Google

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